UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

<u>PETITION FOR REVIEW/NOTICE OF APPEAL</u>

Notice is hereby given that the petitioner(s)/appellant(s) listed below hereby appeal(s) the below-noted case to the United States Court of Appeals for the Federal Circuit.

Originating Tribunal *(Name of Agency, Board, Commission, Office, Bureau, or Court whose decision is being appealed)*:   <u>USPTO Patent Trial and Appeal Board</u>

Case number being appealed: <u>IPR2021-01461</u>

Case title being appealed: <u>Facebook, Inc. v. Xerox Corporation</u>

Date of final decision or order being appealed: <u>03/22/2023</u>

Date decision or order was received: <u>03/22/2023</u>

▣ I have attached a copy of the decision or order being appealed.

List all Petitioners/Appellants (List each party filing this appeal. Do not use "et al." or other abbreviations. Attach continuation pages if necessary.)

Xerox Corporation

Date: <u>05/23/2023</u>

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

_____

FACEBOOK, INC.,
Petitioner

v.

XEROX CORPORATION,
Patent Owner

_____

Case: IPR2021-01461
U.S. Patent No. 9,208,439 B2

_____

PATENT OWNER'S NOTICE OF APPEAL

Mail Stop "PATENT BOARD"
Patent Trial and Appeal Board
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313

Pursuant to 35 U.S.C. §§ 141-142 and 319, 37 C.F.R. §§ 90.2-90.3, Federal Rule of Appellate Procedure 15, and Federal Circuit Rule 15, Patent Owner Xerox Corporation ("Xerox") hereby provides notice that it appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision of the Patent Trial and Appeal Board (the "Board") entered on March 22, 2023 (Paper 41, "Final Written Decision"), and from all underlying findings, determinations, rulings, opinions, orders, issues, and decisions regarding the *inter partes* review of United States Patent No. 9,208,439 B2 (the "'439 Patent"). This Notice of Appeal and petition for review of the Final Written Decision is timely under 37 C.F.R. § 90.3(a)(1), having been filed within 63 days of the Final Written Decision.

For the limited purpose of providing the Director with the information requested in 37 C.F.R. § 90.2(a)(3)(ii), issues on appeal may include but are not limited to the Board's factual findings and conclusions of law, the Board's determinations of the unpatentability of claims and any finding or determination supporting or relating to such determinations of unpatentability including but not limited to claim construction issues, obviousness issues, the scope of the alleged prior art, Board findings that conflict with the evidence of record and are not supported by substantial evidence, as well as all other issues decided adversely to Patent Owner in any orders, decisions, rulings and/or opinions, further including but not limited to: (i) the Board's interpretation of the alleged prior art; (ii) the

Board's claim constructions; (iii) the Board's determination that claims 1-5, 7-11, 13-17, and 19-20 of the '439 Patent were shown to be obvious under 35 U.S.C. § 103(a) and are thus unpatentable; (iv) the Board's determination that contingent substitute claims 21-25, 27-31, 33-37, and 39-40 were shown to be obvious under 35 U.S.C. § 103(a) and are thus unpatentable; (v) the Board's determination that PARC did not show that contingent substitute claims 21-25, 27-31, 33-37, and 39-40 did not contain new matter; (vi) the Board's legal errors in undertaking its obviousness analyses; (vii) the Board's motivation to combine analyses; (viii) the Board's analysis of secondary considerations of nonobviousness; (ix) the Board's legal errors in undertaking its new matter analysis; (x) the Board's findings that conflict with the evidence of record or are otherwise unsupported by substantial evidence; (xi) the Board's failure to consider evidence of record (including testimonial and documentary) fully and properly; and (xii) any other findings or determinations supporting or relating to these issues as well as all other issues decided adversely to Patent Owner in any orders, decisions, rulings, or opinions in this proceeding.

Simultaneously with this submission, Patent Owner is filing a true and correct copy of this Notice of Appeal with the Director of the United States Patent and Trademark Office as well as a true and correct copy of the same, along with the required filing fee, with the Clerk of the United States Court of Appeals for the

Federal Circuit as set forth in the accompanying Certificate of Filing.

Dated: May 23, 2023   Respectfully submitted,

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U.S. Patent No. 9,208,439

CERTIFICATE OF FILING

The undersigned hereby certifies that, in addition to being electronically filed, a true and correct copy of the above-captioned PATENT OWNER'S NOTICE OF APPEAL is being filed via Priority Mail Express with the Director on May 23, 2023, at the following address:

Director of the United States Patent and Trademark Office
c/o Office of the General Counsel, 10B20
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450

The undersigned also hereby certifies that a true and correct copy of the above-captioned PATENT OWNER'S NOTICE OF APPEAL and the filing fee is being filed via CM/ECF with the Clerk's Office of the United States Court of Appeals for the Federal Circuit on May 23, 2023.

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that the foregoing PATENT OWNER'S NOTICE OF APPEAL was served via electronic mail on May 23, 2023, in its entirety on the following:

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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FACEBOOK, INC.,
Petitioner,

v.

PALO ALTO RESEARCH CENTER LLC,
Patent Owner.

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Before KARL D. EASTHOM, SHEILA F. McSHANE, and
CHRISTOPHER L. OGDEN, *Administrative Patent Judges*.

OGDEN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Denying Patent Owner's Motion to Amend
35 U.S.C. § 318(a)

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I. INTRODUCTION

In response to a Petition (Paper 2, "Pet.") filed by Petitioner Facebook, Inc. ("Facebook"), the Board instituted an *inter partes* review of claims 1–5, 7–11, 13–17, 19, and 20 of U.S. Patent No. 9,208,439 B2 (Ex. 1001, "the '439 patent"). Paper 9, ("Dec."). Patent Owner Palo Alto Research Center Inc. (now Palo Alto Research Center LLC) ("PARC") filed a Patent Owner Response (Paper 14, "PO Resp."), Facebook filed a Reply to the Patent Owner Response (Paper 20, "Pet. Reply"), and PARC filed a Sur-reply (Paper 27, "PO Sur-reply").

PARC also filed a Contingent Motion to Amend proposing substitute claims 21–40 if we find the original claims unpatentable. Paper 13 ("MTA"). Facebook filed an Opposition to this Motion to Amend (Paper 19, "Pet. Opp. MTA"). After we issued Preliminary Guidance on the Motion to Amend under the Board's Motion to Amend Pilot Program (Paper 25), PARC filed a Reply (Paper 26, "PO Reply MTA"). PARC's Reply stipulated to the withdrawal of proposed substitute claims 26, 32, and 38. *See* PO Reply MTA 1. Then Facebook filed a Sur-reply. Paper 31 ("Pet. Sur-reply MTA").

We held an oral hearing on December 12, 2022, and the transcript is entered on the record. Paper 37 ("Tr.").

This is a final written decision under 35 U.S.C. § 318(a) as to whether the claims challenged in the *inter partes* review are unpatentable. For the reasons below, we conclude that Facebook has shown that all the challenged claims are unpatentable on at least one ground of the Petition. Facebook has also shown, by a preponderance of the evidence, that all pending proposed

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substitute claims are unpatentable and PARC has failed to show that they do not contain new matter, so we also deny PARC's Motion to Amend.

II. BACKGROUND

A.   RELATED PROCEEDINGS

Both parties are involved in the following related U.S. district court case: *Palo Alto Research Center Inc. v. Facebook, Inc.*, No. 2:20-cv-10753-AB (C.D. Cal. filed Nov. 25, 2020). Pet. 1; Paper 3, 2. According to Facebook, the district court granted a stipulated stay of this proceeding. Pet. 4 (citing Ex. 1014 (granting joint request to stay proceedings)). The parties also identify the following related matters: *Palo Alto Research Center Inc. v. Twitter, Inc.*, No. 2:20-cv-10754-AB (C.D. Cal. filed Nov. 25, 2020); *Palo Alto Research Center Inc. v. Snap Inc.*, No. 2:20-cv-10755-AB (C.D. Cal. filed Nov. 25, 2020). Pet. 1; Paper 3, 2–3.

As PARC notes, the '439 patent is also the subject of *inter partes* reviews IPR2021-00986 (instituted Nov. 23, 2021) and IPR2021-01430 (instituted Mar. 15, 2022). Paper 3, 3.

B.   THE '439 PATENT (EX. 1001)

The '439 patent issued on December 8, 2015 from an application filed on April 29, 2013. Ex. 1001, codes (22), (45). It relates to "a method and system for collecting mobile device contextual information and facilitating efficient adaptation of a generic contextual intelligence system for customized applications." Ex. 1001, 1:8–12. A context-aware system on a mobile device detects the computing environment, and the system may

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recommend activities, such as leisure activities, based on a user model. *Id*. at
1:22–23, 1:30–31.

Figure 6, reproduced below, is a flowchart illustrating the steps of
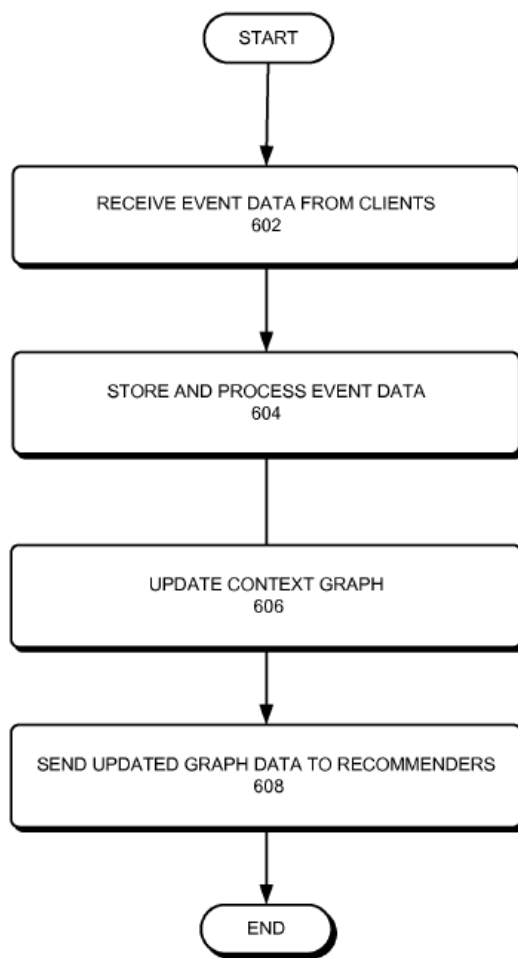processing an event. Ex. 1001, 2:23–25.

FIG. 6

In the steps shown in Figure 6 above, a server receives event data from
clients (operation 602), and then stores and processes the event data
(operation 604). *Id.* at 9:13–19. The server then analyzes the event data and
uses it to update a "context graph" (operation 606). *Id*. at 9:19–24. Next, the

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server sends the context graph data, and changed graph data, to relevant "recommenders" (operation 608). *Id*. at 9:26–29.

According to the '439 patent, "[a] context graph is an in-memory model that stores facts and assertions about a user's behavior and interests." Ex. 1001, 3:20–22. "A recommender is an application that recommends items or activities for a user." *Id*. at 3:23–25.

Figure 4, reproduced below, is a block diagram relating events, a mapper, and a context graph. Ex. 1001, 6:59–61.

FIG. 4
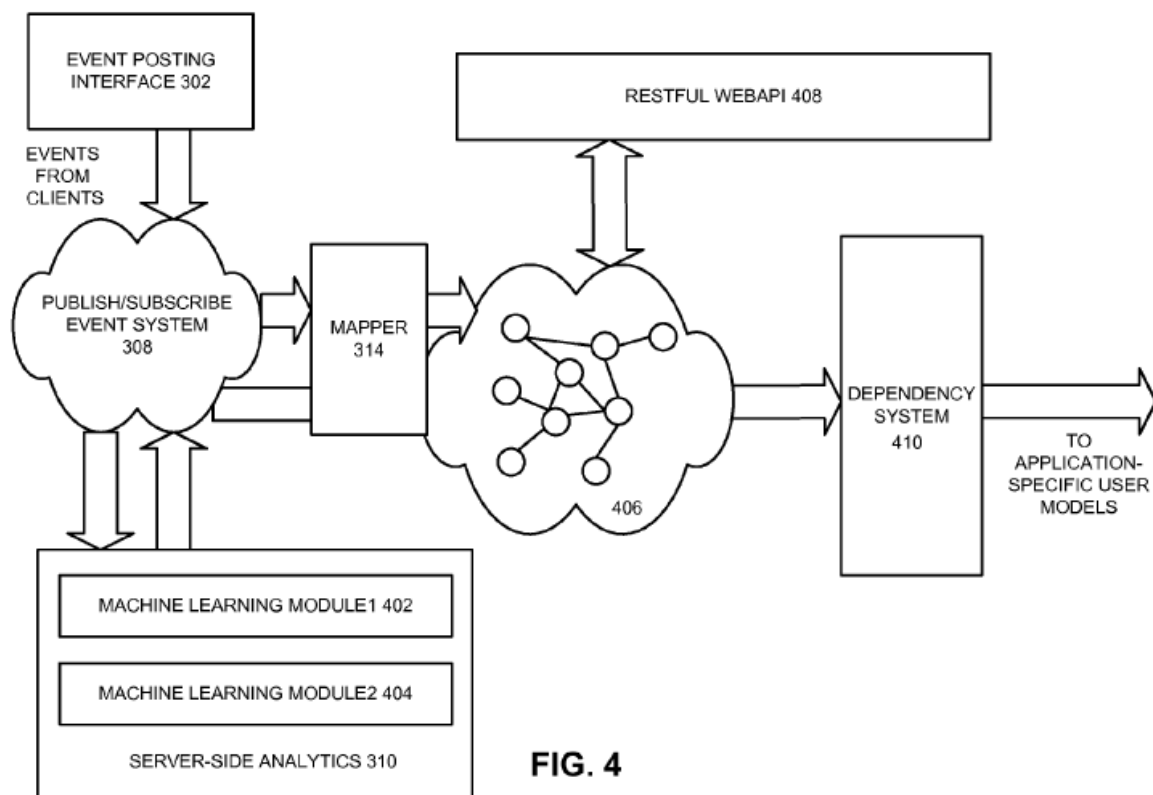
As shown in Figure 4, event posting interface 302 sends events received from clients to publish/subscribe event system 308. *Id*. at 7:7–9. Based on subscriptions to publish/subscribe event system 308, mapper 314 uses the event data to modify context graph 406. *Id*. at 7:7–9, 7:44–47. "Context graph 406 functions as a storage component of a generalized user model. A

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user model describes predicted current and future activities and interests for a user." *Id.* at 7:34–36.

C.   CHALLENGED CLAIMS AND GROUNDS

Claims 1, 7, and 13 of the '439 patent are independent. Claim 1, representative of the challenged claims, reads as follows:

1. A method, comprising:

[a] receiving, from a mobile device, event data derived from contextual data collected using detectors that detect a physical context surrounding the mobile device;

[b] modifying a context graph that stores facts and assertions about a user's behavior and interests using the event data;

[c] in response to determining that there exists a registration for notification of changes that matches the modification to the context graph, sending a notification of context graph change to a recommender.

Ex. 1001, 10:30–40 (Facebook's reference letters added in brackets).

Facebook argues three grounds for *inter partes* review, as summarized in the following table:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–4, 7–10, 13–16, 20	103[1]	Cheng,[2] Falchuk[3]
5, 11, 17	103	Cheng, Falchuk, Richardson[4]

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[1] 35 U.S.C. § 103 (2018).

[2] Cheng, US 2013/0018954 A1 (published Jan. 17, 2013) (Ex. 1003).

[3] Falchuk et al., US 8,694,901 B2 (issued Apr. 8, 2014) (Ex. 1004).

[4] Leonard Richardson & Sam Ruby, RESTFUL Web Services (2007) (Ex. 1005).

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| 19 | 103 | Cheng, Falchuk, Shalloway,[5] Powell[6] |

Pet. 3.

D.   DECLARATORY TESTIMONY

Facebook relies on two declarations by Christopher M. Schmandt. Exs. 1002, 1021. Facebook also relies on a declaration by Dr. Sylvia D. Hall-Ellis (Ex. 1015) as to the public availability of Richardson, Shalloway, and Powell. *See* Pet. 11.

PARC relies on two declarations by Dr. David Martin. Exs. 2017, 2024.

III. PARC'S OBJECTIONS TO ALLEGED UNTIMELY ARGUMENTS

On September 13, 2022, in lieu of a motion to strike, we authorized PARC to submit a list of allegedly untimely arguments made in Facebook's Reply. Paper 22; Ex. 3001. We noted that an order striking portions of a party's brief "is an exceptional remedy that the Board expects will be granted rarely" because in most cases, "the Board is capable of identifying new issues or belatedly presented evidence when weighing the evidence at the close of trial, and disregarding any new issues or belatedly presented evidence that exceeds the proper scope of reply." Paper 22, 1 (quoting PTAB Consolidated Trial Practice Guide 80 (Nov. 2019), https://go.usa.gov/xpvPF). PARC submitted such a list (Paper 23), and

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[5] Alan Shalloway & James R. Trott, Design Patterns Explained: A New Perspective on Object-Oriented Design (2d ed. 2005) (Ex. 1006).

[6] Thomas A. Powell, Ajax: The Complete Reference (2008) (Ex. 1007).

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Facebook responded (Paper 24). PARC also addressed the issue in its Sur-reply. *See* PO Sur-reply 5–7.

All of the allegedly untimely arguments relate to either the construction of the term "facts and assertions" or the identification of facts and assertions within Cheng. *See* Paper 23, 1–2. Having reviewed the arguments, we do not consider them untimely. As we discuss in more detail below, Facebook relied on the ordinary and customary meaning of the term "facts and assertions" in its Petition, and then when PARC raised an alternative construction of the term in its Response, Facebook responded to those arguments. *See infra* Sections IV.B.2, IV.C.4(a).

Facebook's Reply only responded to arguments raised in PARC's Response and was not untimely. *See* 37 C.F.R. § 42.23(b) (permitting a petitioner to respond to arguments in a patent owner response); *Anacor Pharm., Inc. v. Iancu*, 889 F.3d 1372, 1380–81 (Fed. Cir. 2018) ("[T]he petitioner in an inter partes review proceeding may introduce new evidence after the petition stage if the evidence is a legitimate reply to evidence introduced by the patent owner, or if it is used 'to document the knowledge that skilled artisans would bring to bear in reading the prior art identified as producing obviousness.'" (quoting *Genzyme Therapeutic Prod. Ltd. P'ship v. Biomarin Pharm. Inc.*, 825 F.3d 1360, 1369 (Fed. Cir. 2016))). Moreover, PARC had a meaningful opportunity to address the arguments in its Sur-reply and in oral argument. *See* PO Sur-reply 7–12; Tr. 22–34.

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Thus, we do not find Facebook's contested arguments untimely and we have considered them in our decision.[7]

IV. GROUNDS OF THE PETITION

For the reasons below, we determine that Facebook has shown, by a preponderance of the evidence, that claims 1–4, 7–10, 13–16, and 20 of the '439 patent are unpatentable under the ground based on Cheng and Falchuk; that claims 5, 11, and 17 are unpatentable under the ground based on Cheng, Falchuk, and Richardson; and that claim 19 is unpatentable under the ground based on Cheng, Falchuk, Shalloway, and Powell. Before analyzing these grounds in detail, we address two matters that underlie our analysis: the level of ordinary skill in the art and the construction we will apply to the claim terms.

A.   LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the pertinent art at the time of the invention is a factor in how we construe patent claims. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). It is also one of the factors we consider when determining whether a patent claim is obvious over the prior art. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

To assess the level of ordinary skill, we construct a hypothetical "person of ordinary skill in the art," from whose vantage point we assess obviousness and claim interpretation. *See In re Rouffet*, 149 F.3d 1350, 1357

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[7] We do not consider one of the challenged arguments, offered in the alternative, because we find Facebook's main argument persuasive. *See infra* note 11.

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(Fed. Cir. 1998). This legal construct "presumes that all prior art references in the field of the invention are available to this hypothetical skilled artisan." *Id.* (citing *In re Carlson*, 983 F.2d 1032, 1038 (Fed. Cir. 1993)).

Relying on Mr. Schmandt's testimony, Facebook argues that a person of ordinary skill in the art "would have possessed at least a bachelor's degree in electrical engineering or computer science, and two years of work experience in the field of context-based computer systems, such as the collection, processing and use of context data in computer systems capable of adapting their operation based on context." Pet. 6 (citing Ex. 1002 ¶¶ 15–18). Facebook also contends that a person might qualify as an ordinarily skilled artisan "with more formal education and less technical experience, or vice versa." *Id.*

For this proceeding, PARC does not dispute this proposed level of ordinary skill. PO Resp. 16–17. Because Facebook's uncontroverted articulation of the level of ordinary skill in the art is supported by testimonial evidence and appears consistent with the types of problems and solutions in the '439 patent, we adopt it for this decision. *See, e.g.*, Ex. 1001, 1:4–33 ("Background" section of the '439 patent, describing the field and related art as relating to the use of using contextual data in computer systems).

B.   CLAIM CONSTRUCTION

In an *inter partes* review, we construe a patent claim "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b) (2021). This generally includes "construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in

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the art and the prosecution history pertaining to the patent." *Id.* The ordinary and customary meaning of a claim term "is its meaning to the ordinary artisan after reading the entire patent," and "as of the effective filing date of the patent application." *Phillips*, 415 F.3d at 1313, 1321. There are only two circumstances in which a construction departs from the ordinary and customary meaning: "1) when a patentee sets out a definition and acts as [their] own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution." *Thorner v. Sony Comput. Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012). Any such special meaning of a term "must be sufficiently clear in the specification that any departure from common usage would be so understood by a person of experience in the field of the invention." *Multiform Desiccants Inc. v. Medzam Ltd.*, 133 F.3d 1473, 1477 (Fed. Cir. 1998).

To construe the claim terms, "we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006).

Facebook did not initially identify any claim terms needing an explicit construction. *See* Pet. 8. However, PARC identified two terms for which it offered substantial claim construction arguments: the term "context graph" and the term "facts and assertions." We address these two terms below. To the extent that other claim terms are significant, we discuss them below in the context of the asserted prior art.

1. "Context Graph"

PARC argues that we should construe the term "context graph" to mean a "per-user, in-memory, graph-based model." PO Resp. 18 (emphasis

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omitted). According to PARC, "the claim language itself explicitly states that the facts and assertions are stored in a graph." *Id.* at 18–19. PARC also points to dependent claim 20, which refers to "topological changes in the context graph" and to "properties of nodes and edges in the context graph." *Id.* at 19 (emphasis omitted) (quoting Ex. 1001, 12:53–55); *see also* PO Sur-reply 2–3 (arguing that Facebook improperly reads out the word *graph* in its analysis of the term "context graph").

PARC also points to supporting disclosures in the '439 patent specification, including Figure 4, which according to PARC describe context graph 406 as having nodes and edges that, through their topology, store facts and assertions about user behavior and actions. PO Resp. 20–21 (citing Ex. 1001, 7:26–28, 7:58–60, Fig. 4; Ex. 2017 ¶ 81); *see also* PO Sur-reply 3–5. PARC acknowledges that the '439 patent discloses a number of ways to store the context graph in memory, for example using a "type-less approach to data storage" or storing the data as "entity-relationship data and unstructured data." PO Resp. 21 (quoting Ex. 1001, 7:36–40) (citing Ex. 2017 ¶¶ 81–86). But no matter the underlying representation, PARC contends that the data is ultimately stored as a graph-based model. *Id.* PARC also contends that, during prosecution of the '439 patent, the applicant "distinguished the prior art on the basis of the context graph's nodes." PO Resp. 21–22 (citing Ex. 2020, 118–19).

In its Reply, Facebook contends that PARC "does not present any argument that [its proposed] construction would provide any basis to distinguish the prior art in this IPR." Pet. Reply 2 (emphasis omitted). Thus, Facebook urges us to reject PARC's construction as immaterial in this proceeding. *Id.* at 2–4.

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We agree with Facebook. As we discuss below, Cheng teaches a graph-based model that stores data in memory on a per-user basis. *See infra* Section IV.C.4(a); Ex. 1003, Fig. 7. Also, as PARC acknowledges, Facebook's expert Mr. Schmandt stated in deposition that he assumed, for his analysis, that the term "context graph" requires a "graph-based model." PO Resp. 22 (citing Ex. 2019, 36:16–37:8); *see also* PO Sur-reply 4.

Thus, because Facebook's analysis of Cheng is consistent with the assumption that "context graph" has the meaning PARC proposes in this proceeding, we do not need to construe the term "context graph" to reach our decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy' . . . ." (quoting *Vivid Techs., Inc. v. Am. Sci & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

2. *"Facts and Assertions"*

In its Petition, Facebook did not propose an explicit construction of the term "facts and assertions," but appears to have relied on what it regarded as the term's plain and ordinary meaning as referring to "information" about a user's behavior and interests that is stored in the form of nodes (concepts) and edges (ontological relationship between concepts) of a context graph. Pet. 8, 19–21.

In its Response, PARC argues that Facebook fails to explain any distinction between "facts" and "assertions." PO Resp. 25. According to PARC, these terms must be presumed to mean different things. *Id.* at 27 (citing *CAE Screenplates Inc. v. Heinrich Fiedler GmbH*, 224 F.3d 1308,

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1317 (Fed. Cir. 2000); *Becton, Dickinson & Co. v. Tyco Healthcare Grp., LP*, 616 F.3d 1249, 1254 (Fed. Cir. 2010)).

Facebook disagrees that claim 1 or the '439 patent as a whole require that "facts" and "assertions" be entirely distinct categories. Pet. 5–6. According to Facebook, the only two mentions of "facts" and "assertions" in the '439 patent specification do not distinguish between the two or between how the two might be stored or handled. Pet. Reply 6–7 (citing Ex. 1001, 3:20–22, 7:26–33). Facebook also contends that both Facebook's and PARC's experts agree that both facts and assertions refer to "a property of an entity," and that a "fact" further includes an indication of truth. *Id.* at 7 (citing Ex. 1018, 12:10–24; Ex. 2019, 41:9–11; Ex. 1021 ¶ 21–22). Thus, according to Facebook, "[a] particular stated property could . . . qualify as *both* a fact *and* an assertion. An assertion with an indication of truth, for example, qualifies as a fact." Pet. Reply 7; *see also id.* at 7–8 (citing Ex. 1021 ¶ 23). PARC does not appear to contest this. *See* Tr. 26:5–8 (counsel for PARC stating that "both experts did read the specification and provide their interpretations of what facts and assertions are and . . . I do believe that at least as to facts they both agree that it's something that has an indication of truth").

Thus, the parties and their experts appear to agree that a person of ordinary skill in the art would have considered a "fact" to be different from an "assertion" because, unlike an assertion, a fact would necessarily include an indication of truth.[8] Where the parties' positions appear to differ is that

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[8] PARC contends that Facebook made inconsistent arguments in this regard by also arguing that there is no difference between facts and assertions. *See* PO Resp. 28–29 (citing Pet. 20–21; Ex. 2019, 41:3–11); PO Sur-reply 7

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Facebook contends that a single data entity in a context graph can be both a fact and an assertion, whereas PARC disagrees. Pet. Reply 7–8; PO Sur-reply 8 (citing *Becton, Dickinson*, 616 F.3d at 1254; *HTC Corp. v. Cellular Commc'ns Equip., LLC*, 701 F. App'x 978, 982 (Fed. Cir. 2017)); *id.* at 10 (arguing that a fact ("something that is true") cannot be an assertion ("something that may or may not be true")).

We agree with the parties that a person of ordinary skill in the art would have understood the term "fact" to include an indication of truth, whereas an assertion need not include such an indication. However, we disagree with PARC that a person of ordinary skill would have considered the term "assertion" to exclude facts. Indeed, in its ordinary and customary meaning, a fact stored in a context graph would be a type of assertion.

We appreciate PARC's argument that when two different terms appear in a claim, they presumably refer to different things. *See* PO Resp. 27 (citing *CAE Screenplates*, 224 F.3d at 1317). And we agree that the two terms have different meanings in claim 1 based on the plain meaning of each term. However, the specification refers to "stor[ing] facts and assertions about a user's behavior and interests," which simply appears to identify a single category of data for storage, i.e., "facts and assertions," without specifying a clear difference between "facts" and "assertions." *See* Ex. 1001, 3:21–22. In any event, we find no evidence of record suggesting that either (1) the

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(citing Pet. Reply 8–9). Because Facebook appears to have been relying on what it regarded as the plain meaning of the terms without proposing an explicit construction, we do not interpret Facebook's argument in the Petition (Pet. 20–21) to imply that there is no distinction between a fact and an assertion, and do not find Mr. Schmandt's later testimony (*see, e.g.*, Ex. 2019, 41:3–11) inconsistent with arguments made in the Petition.

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ordinary and customary meaning of the term "assertion" excludes facts, or (2) that the '439 patent uses these terms in a way that departs from their ordinary and customary meaning. That claim 1 requires the presence of both "facts" *and* "assertions" does not render the two terms superfluous, as this would exclude prior art in which a context graph includes only assertions but not facts. On the other hand, a disclosure of a collection of facts would meet the term "facts and assertions" because a person of ordinary skill in the art would have regarded any subset of the facts to also be assertions.

C.   CLAIM 1

Turning to the grounds of the Petition, we begin with the challenge to claim 1, which asserts that claim 1 is unpatentable under 35 U.S.C. § 103 as obvious over Cheng in view of Falchuk. *See* Pet. 3, 11–36. For this challenge, Facebook relies primarily on Cheng for the preamble and limitations 1[a]–[c] except for the final aspect of limitation 1[c] that recites "sending a notification of context graph change to a recommender." Pet. 9. For that part of limitation 1[c], Facebook relies on the teachings of Falchuk. Pet. 9–10.

A claim is unpatentable under § 103 for obviousness "if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains." 35 U.S.C. § 103; *see also KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). When a ground in a petition is based on a combination of references, we consider "whether there was an apparent reason to combine the known elements in the fashion

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claimed by the patent at issue." *Id.* at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

We base our obviousness inquiry on factual considerations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) any objective indicia of obviousness or non-obviousness that may be in evidence. *See Graham*, 383 U.S. at 17–18.

Considering these factors,[9] we determine that Facebook has shown, by a preponderance of the evidence, that claim 1 is unpatentable under § 103 as obvious over Cheng in view of Falchuk. We begin our analysis with a brief overview of Cheng and Falchuk, and then we address the parties' contentions with respect to the limitations of claim 1.

1.   *Overview of Cheng*

Cheng describes "situation-aware user sentiment social interest models," particularly in the context of social networking services. Ex. 1003 ¶¶ 3, 5–9. In discussing the background art, Cheng notes that other companies had been developing analytics to extract a user's interest and sentiments from social networking data, but these efforts were "blind[] about the user's situation" at any particular moment, which a system might use to make contextually appropriate suggestions to the user. *Id.* ¶ 10. "For example, even though a user may like good wine, suggesting going to a wine tasting nearby may not be a good idea when his friends with him at the time do not like wine." *Id.*

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[9] Neither party presents evidence of objective indicia of obvious or non-obviousness, so no such evidence factors into our decision.

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Thus, Cheng describes "[a] method for constructing user models from user usage and context data . . . where a personal interest graph for a user is construct[ed] from interests of the user derived from usage data and situational data derived from one or more sensors of [an] electronic device." Ex. 1003, code (57). "The personal interest graph can be modified by annotating one or more nodes of the personal interest graph with influence information." *Id.*

Figure 2 of Cheng, reproduced below, illustrates the high-level architecture of this system (Ex. 1003 ¶ 19):
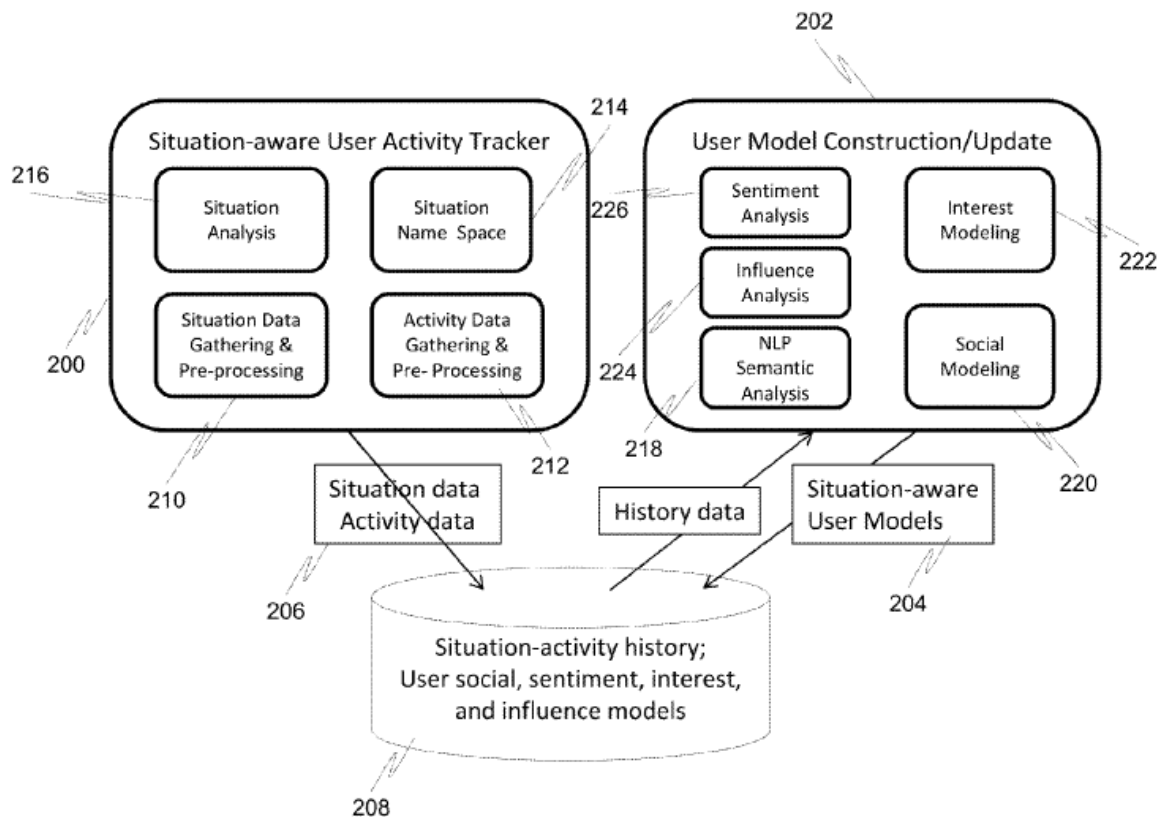

FIG. 2

As shown above in Figure 2, Cheng's system has two main parts:
(1) situation-aware user activity tracker 200, which logs user activity data within a device and application, and corresponding situation data at the time

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of usage; and (2) user model construction/update module 202, which "builds and updates user models." Ex. 1003 ¶ 37. Storage 208 stores the user's annotated "relations, interests, influence, and sentiments." *Id.* "[T]he output of the system is a set of models 204 about the user's relationship, interests, who influences the user about a topic, whom the user influences about a topic, and the user's sentiments towards a topic/concept or person." *Id.*

As part of construction/update module 202, sentiment analysis module 226 "can compute the user's sentiments about people and concepts in various situations" (Ex. 1003 ¶ 48), as illustrated below in Figure 7:

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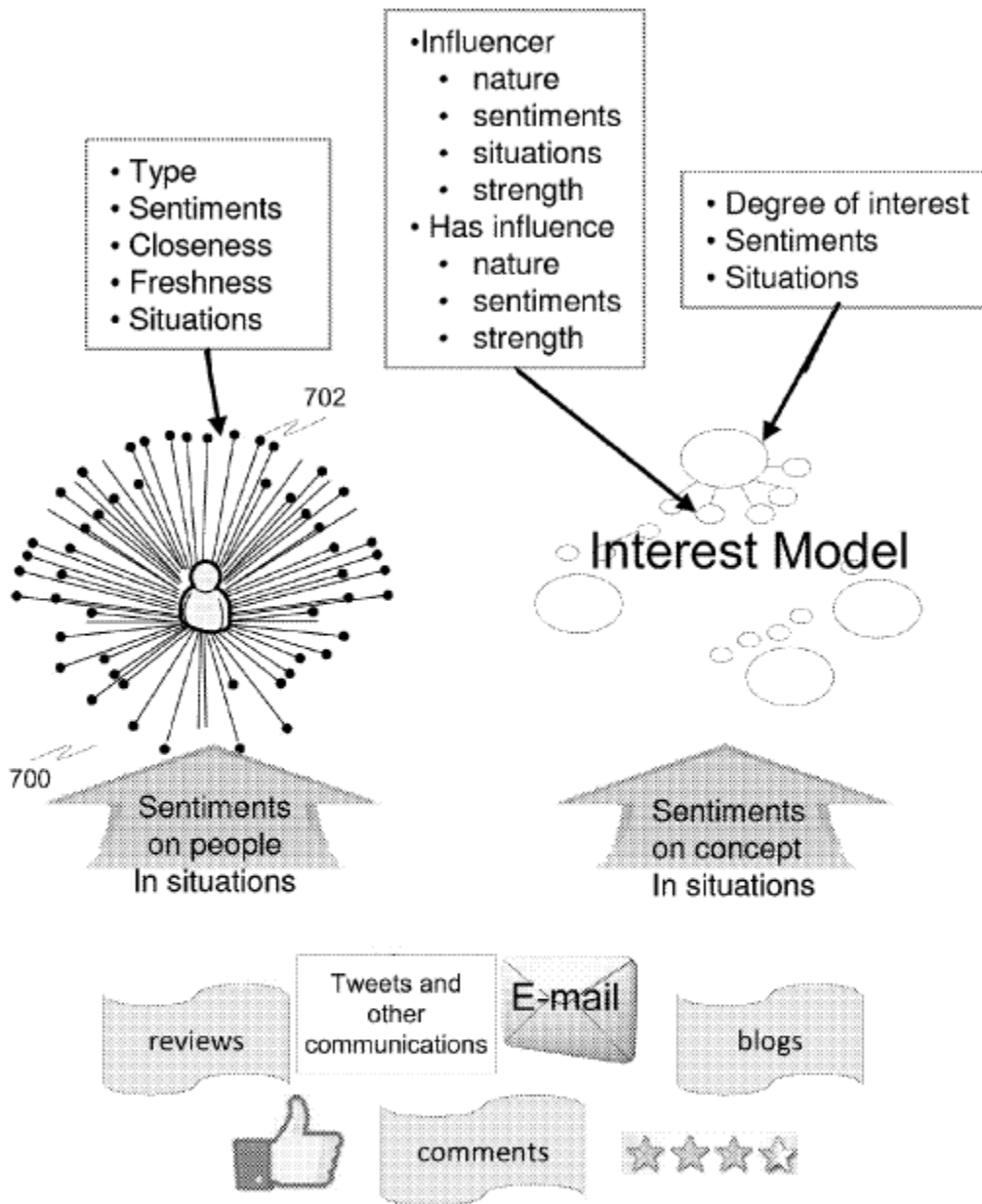Patent 9,208,439 B2

FIG. 7

Figure 7, above, depicts "the output of sentiment analysis." Ex. 1003 ¶ 48.

The lower part of Figure 7 illustrates how module 226 may obtain user

sentiments "by tracking user actions such as clicks of a like, share, or

recommend button," or "by analyzing the texts associated with user online

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activities such as blogs, emails, tweets, reviews, comments, etc." *Id.* Using this information, module 226 constructs personal interest graph 700, a tree-like structure that includes a number of edges and nodes such as node 702. *Id.* Node 702 "can be annotated with the sentiment information about the concept represented by the node," as illustrated in the box above personal interest graph 700. *Id.* These annotations may include "the types and the strengths of users' sentiments and the situation in which such sentiments are expressed." *Id.*

For example, an "edge" may link the user to a node representing another person. *See* Ex. 1003 ¶ 48. "When the user expresse[s] sentiments toward a person, the sentiment information can be recorded in the personal social graph, for example by annotating the edge linking the user to the person." *See id.*

Once constructed, the personal interest graphs "can then be directly used by applications, such as for predicting user needs, for making recommendations, and for decision making." Ex. 1003 ¶ 52. In one embodiment, "a client device runs the situation-aware user activity tracker and sends the data to be stored on a server or in a cloud." *Id.* ¶ 55. Then, "[a]t recommendation time, the client device identifies the current situation, and asks the server/cloud to identify the items for recommendation." *Id.*

2. *Overview of Falchuk*

Falchuk describes a "system and method for determining and presenting contextual suggestions on a mobile device" relating to a "user context." Ex. 1004, code (57). By "user context," Falchuk "mean[s] a machine[-]readable version of the multitude of information surrounding the daily life of a user." *Id.* at 2:11–13. The user context can be stored "as a

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series of instances" of "a hierarchic, rich state model having subtrees, such that each subtree is an instance of a context ontology and thus permits machine-readable interpretation and inference." *Id.* at 4:42–44, 4:61–64. "The model is dynamically . . . updated as context changes," and "[a] key part of the system captures the user's 'goals.'" *Id.* at 5:23–24, 5:28. These goals can be entered explicitly or inferred based on the user's context. *See id.* at 5:39–44. The system seeks to "provide the right reminder at the right time and place, as well as mitigating conflicting and complementary reminders and events." *Id.* at 2:7–9.

The components of Falchuk's system are illustrated below in Figure 2:
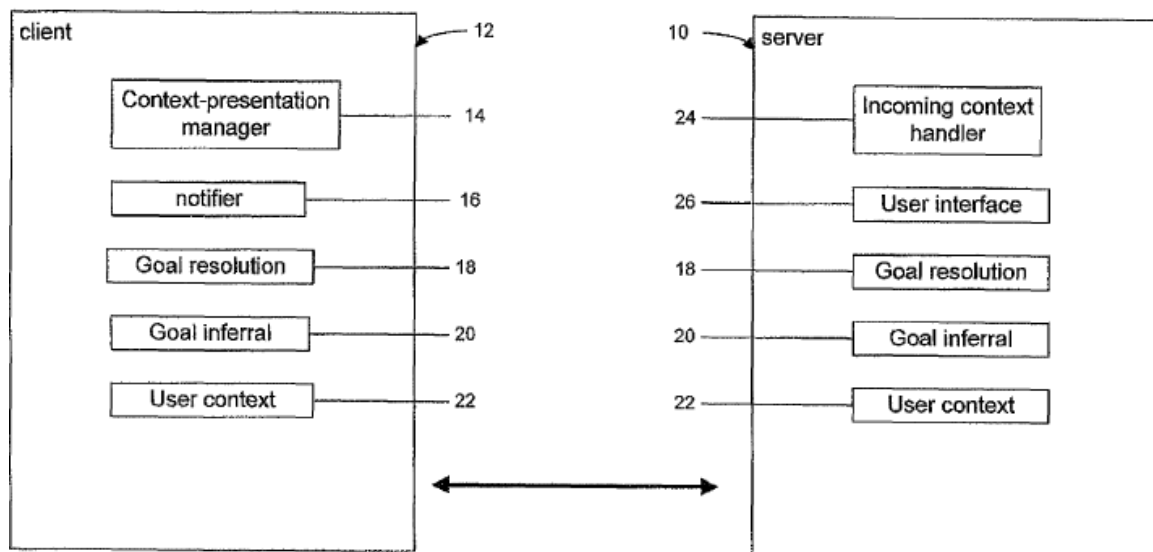
FIGURE 2

Figure 2, above, shows server 10 on the right-hand side, which includes components such as incoming context handler 24. Ex. 1004, 3:33–34. Incoming context handler 24 receives and parses incoming messages relating to the user's context. *See id.* at 4:47–54. Client 12 is shown on the left-hand side of Figure 2, and has components including context-presentation

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manager 14, which "can operate to queue up notifications and/or suggestions that are to be conveyed to the user." *Id.* at 3:56–58. Client 12 also includes notifier 16, which "can marshal a visual or ambient notification that the system intends the user to consume." *Id.* at 4:4–5. Server 10 and client 12 may each also have goal resolution components 18, goal inferral components 20, and user context components 22, which are involved in identifying goals and storing the user context. *See id.* at 3:32–33, 3:35–36, 4:10–29.

When an event occurs that changes the user context, "goal resolution component 18 scours the user context 22, possibly applying rules, to see whether a given goal can be advanced by a given event(s). For example, if event e (that just happened) makes goal g possible, then a notification may be readied." Ex. 1004, 4:10–18. Context-presentation manager 14 queues up such notifications until an appropriate time, after which notifier 16 displays the notification to the user, where the display may be on the screen of a mobile device. *See id.* at 3:56–60, 6:28–31.

3.   *Preamble and Limitation 1[a]*

The preamble and limitation 1[a] of claim 1 recite "[a] method, comprising: receiving, from a mobile device, event data derived from contextual data collected using detectors that detect a physical context surrounding the mobile device." Ex. 1001, 10:30–33. Facebook argues that Cheng and Falchuk both disclose this method, and that "Cheng discloses receiving event data from a mobile device, such as a mobile phone, as claimed." Pet. 11.

In particular, Facebook identifies the recited "contextual data" in Cheng's disclosure as "raw data collected by sensors associated with a

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mobile device," and identifies "event data" as "data derived by 'pre-processing' the collected contextual data or alternatively, to the data derived from one or more steps of the 'data fusion' process described in Cheng." Pet. 13; *see also* Pet. 11–18 (citing Ex. 1001, 2:60–62 (explaining the term "[c]ontextual data"), 3:4–12, 3:49–51, 9:2–5, 9:9–11; Ex. 1002 ¶¶ 62, 65, 66, 68; Ex. 1003 ¶¶ 11, 31, 32, 34, 35, 37, 38, 40, 42, 55, 57, claim 24, Fig. 2).

PARC does not contest Facebook's arguments regarding the preamble[10] or limitation 1[a]. *See generally* PO Resp. We find those arguments persuasive, and we credit Dr. Schmandt's supporting testimony, in particular, that a person of ordinary skill in the art would have considered the raw data collected by the sensors in Cheng's mobile device to meet limitation 1[a]. *See* Ex. 1002 ¶¶ 62–68.

4.   *Limitation 1[b]*

Limitation 1[b] recites "modifying a context graph that stores facts and assertions about a user's behavior and interests using the event data." Ex. 1001, 10:34–36. Facebook contends that Cheng discloses the recited context graph in the form of Cheng's "personal interest graph." *See* Pet. 19–26 (citing Ex. 1001, 3:20–22 (explaining the term "context graph"), 7:26–29, 9:60–10:2; Ex. 1002 ¶¶ 70, 72–76; Ex. 1003 ¶¶ 14, 29, 31, 32, 37, 40, 45, 46, 49, 53, 54, 56, 58, Figs. 5, 8, 9).

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[10] The preamble merely indicates that the claimed invention is a method, which we presume limits the scope of claim 1. But we need not resolve that question because neither party raises the issue and Facebook shows sufficiently that Cheng discloses a method.

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(a)   Whether Facebook's Arguments Are Conclusory or Insufficiently Specific.

In particular, Facebook contends that Cheng's personal interest graph "stores facts and assertions about a user's behavior and interests," as recited, because in this graph, a node "represents a concept and an edge connecting the two concept nodes represents the ontological relationship between the concepts." Pet. 20 (quoting Ex. 1003 ¶ 45) (citing Ex. 1003 ¶ 14). For example, Facebook points to Cheng's disclosure that "[a] node may also carry the information to indicate the degree of a user's interest about the concept represented by the node." Pet. 21 (emphasis omitted) (quoting Ex. 1003 ¶ 46).

In its Response, PARC argues that Facebook fails to explain, in a non-conclusory way, how Cheng teaches limitation 1[b]. PO Resp. 23–24 (citing *TQ Delta, LLC v. Cisco Sys.*, 942 F.3d 1352, 1358 (Fed. Cir. 2019)). In particular, PARC contends that Facebook does not identify which of Cheng's alleged teachings qualify as the recited "facts and assertions" or "a user's behavior and interests." *Id.* at 25. Nor, according to PARC, does either Facebook or Mr. Schmandt explain, in sufficient detail, why Cheng teaches these elements. *See id.* at 25–27 (citing Pet. 21; Ex. 1002 ¶ 72). PARC also argues that Facebook failed to separately identify which elements in Cheng's personal interest graph correspond to "facts," "assertions," "interests," or "behaviors." *Id.* at 27.

In its Reply, Facebook first argues that PARC's arguments as to limitation 1[b] do not hinge on its proposed construction of the term "context graph," and PARC does not contest the Petition on that basis. Pet. Reply 4. We agree. Facebook argues in its Petition that Cheng's personal

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interest graph is "per-user," is stored in memory, and is graph-based, which fulfils PARC's proposed construction of the term "context graph" as being a "per-user, in-memory, graph-based model." *See* Pet. 19–25. PARC does not specifically contest these arguments (*see* PO Resp. 23–27), and we find them persuasive.

Next, Facebook argues that Cheng's personal interest graph includes "facts and assertions" because Cheng discloses facts in the form of ontological relationships (edges of the graph) derived from a user's activity in relation to concepts (nodes of the graph). Pet. Reply 9. According to Facebook, Cheng's disclosure that "concepts can be extracted by analyzing the data associated with a user activity, such as text of a user's online posts . . . is not materially different from the '439 patent's example of 'facts and assertions' about a user's visit to a coffee shop around four o'clock, and the conclusion extracted by analyzing that data that a user 'tends' to drink coffee at four o'clock." *Id.* (quoting Ex. 1003 ¶ 46); Ex. 1001, 7:29–33. Facebook contends that these examples in Cheng and in the '439 patent would qualify as both facts and assertions. Pet. Reply 8–9.[11]

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[11] Facebook also argues, alternatively, that "assertions" could "be mapped to the higher-level determinations in [Cheng's] personal interest graph derived from the 'facts,' such as 'the degree of a user's interest about the concept representing the node,'" or "'information about . . . a sentiment of the user at the time when the usage data suggests that the user expressed interest in the in the interest [sic; concept].'" Pet. Reply 9–10 (alterations in original) (quoting Ex. 1003 ¶ 46; and then quoting *id.* ¶ 14); PO Sur-reply 10–12 (replying to this argument). We need not address this alternative argument because we find Facebook's main argument persuasive.

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In its Sur-reply, PARC does not dispute that the ontological relationships in Cheng's personal interest graph constitute "facts," but argues that these relationships are not assertions, because according to PARC, assertions "may *or may not* be true." PO Sur-reply 10 (citing Ex. 1018, 12:16–13:11; Ex. 2019, 41:3–11).

We find Facebook's argument persuasive, and we disagree with PARC that Cheng's ontological relationships relating to its concept nodes would not also be "assertions" as we construe that term. As we discuss above, the evidence indicates that a person of ordinary skill in the art would have regarded a "fact" as a type of assertion. *See supra* Section IV.B.2. Thus, Facebook persuasively shows that, by disclosing a context graph comprising a collection of facts, Cheng discloses "facts and assertions" as recited in claim 1.

We also find Facebook's arguments in the Petition sufficient to meet its particularity requirement under 35 U.S.C. § 312(a)(3) and its ultimate burden of persuasion. *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) ("To satisfy its burden of proving obviousness, a petitioner . . . must . . . articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness." (citing *KSR*, 550 U.S. at 418)). The Petition specifically identifies the ontological relationships between the nodes in Cheng's personal interest graph as the recited "facts and assertions." *See* Pet. 19–21. This is sufficiently specific to meet Facebook's burden, particularly in light of Facebook's further responses in its Reply. *See* Pet. Reply 4–10.

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(b)   Whether Cheng Teaches the "Behavior" Aspect of
        Limitation 1[b]

Facebook argues that Cheng's personal interest graph includes facts
and assertions "about a user's behavior and interests" as recited in
limitation 1[b]. Pet. 19–21. Specifically, Facebook identifies the interests
and behavior as "usage or activity" derived from Cheng's sensor event data.
Pet. 21 (citing Ex. 1003 ¶¶ 14, 46; Ex. 1002 ¶ 72). Facebook also argues that
Cheng's personal interest graph is modified based on the collected situation
data derived from the sensors. Pet. 25–26 (citing Ex. 1003 ¶¶ 37, 40, 45, 53).

In response, PARC argues that Cheng does not teach the "behavior"
aspect of limitation 1[b]. PO Resp. 29. According to PARC, this is because
in Cheng, any information in the personal interest graph about a user's
behavior is not modified "using the event data" as recited in the limitation,
which PARC contends must be based on the user's "physical surroundings,"
such as "the location, movement, and/or compass measurement of the
mobile device." *Id.* at 29–31 (quoting Ex. 1001, 9:3–5) (citing Ex. 1001,
1:43–46, 2:60–62, 5:36–38, 9:2–5, 10:31–36, 11:4–6, 11:54–56, 13:47–51;
Ex. 2017 ¶¶ 89–90). Rather, PARC contends that this information in Cheng
"relates to 'advertisement[s] the user clicked or shared, an item the user
bought, rated, reviewed, shared, recommended," and/or 'updating a profile,
adding/deleting friends, tweets/retweets, likes, shares, recommends, clicks,
online posts, etc.'" *Id.* at 30 (alteration in original) (quoting Ex. 1003 ¶ 46;
and then quoting *id.* ¶ 39).

Facebook argues that PARC mischaracterizes the claim language,
which requires "modifying a context graph . . . using the event data," not

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that the "facts and assertions about a user's behavior and interests"—which "is merely an additional clause that describes properties of the claimed context graph"—must directly be derived from the event data. Pet. Reply 10–11 (citing Ex. 1021 ¶ 14); *see also id.* at 12 (citing Ex. 1021 ¶ 17). According to Facebook, in cross examination Dr. Martin agreed with Facebook's interpretation of the claim. *Id.* at 11 (citing Ex. 1018, 14:13–15:8). Facebook also points to disclosures in the '439 patent that describe modifying the context graph using the event data without reference to how the user's behavior data within the context graph is derived. Pet. 11–12 (citing Ex. 1001, 3:18–22, 3:62–64, 6:8–10, 9:23–25).

In its Sur-reply, PARC characterizes Facebook's argument as "a tortured grammatical exercise" because "how can location be used to modify the context graph if location cannot be reflected in the contents of the context graph?" PO Sur-reply 13. PARC also argues that Dr. Martin's cross-examination testimony is consistent with PARC's argument because whether the context graph or the stored behavior data is modified "using the event data" is "a distinction without a difference." *Id.* According to PARC, "since the context graph is composed of facts and assertions about a user's behavior and interests, the event data must cause a modification to those facts and assertions about a user's behavior and interests. Whether the event data triggers a *modifying* step or a *storing* step is irrelevant." *Id.* at 13–14.

We find Facebook's argument persuasive and disagree with PARC's alternative reading of this part of limitation 1[b]. The sole verb in limitation 1[b] is "modifying," and it is clear that the modification of the context graph, not the storage of behavior data, is what "us[es] the event data." *See* Ex. 1001, 10:34–36. Although the context graph includes

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information about a user's behavior, claim 1 does not explicitly or implicitly require that the behavior data is solely or directly derived from the recited event data.

Thus, we find that Facebook has shown that Cheng discloses modifying the context graph "using the event data" as recited in limitation 1[b]. We also find that, as recited in claim 1, this context graph may include (as it indisputably does in Cheng) behavior and interest information derived from a user's online activity and not necessarily from sensor data describing the physical surroundings of the mobile device.

5. *Limitation 1[c]*

Limitation 1[c] recites, "in response to determining that there exists a registration for notification of changes that matches the modification to the context graph, sending a notification of context graph change to a recommender." Ex. 1001, 10:37–40. Facebook relies on the combination of Cheng and Falchuk to teach this limitation. *See* Pet. 26–36. In particular, Facebook notes that the '439 patent describes a "recommender" as "an application that recommends items or activities for a user." Pet. 26 (emphasis omitted) (quoting Ex. 1001, 3:23–25). Facebook contends that Cheng uses a recommender in conjunction with its personal interest graph for making recommendations based on the model. Pet. 27 (citing Ex. 1003 ¶¶ 11, 52, 54, 56).

But according to Facebook, "Cheng does not provide further detail regarding the interaction between the recommender and the personal interest graph." Pet. 27. Thus, Facebook argues that a person of ordinary skill in the art would have looked to Falchuk for the specific teaching recited in limitation 1[c]. *Id.* Facebook contends that, like Cheng, Falchuk discloses a

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model of user context in the form of a hierarchical tree structure representing a context ontology, which "can include items such as short and long term goals." Pet. 28 (quoting Ex. 1004, 4:65–67) (citing Ex. 1003 ¶ 45; Ex. 1004, 4:42–46, 4:61–64). Facebook contends that in Falchuk, "'events'—such as a change in a user's location—change the user context model," and "in response . . . , the goal resolution component determines whether the event advances a given goal—which may cause a *notification* to occur." Pet. 29 (citing Ex. 1002 ¶ 86; Ex. 1004, 4:10–18, 6:15–31).

According to Facebook, the "registration" recited in limitation 1[c] "corresponds in Falchuk to a goal explicitly entered by a user or inferred by the system." Pet. 31. Facebook identifies the recited "recommender" as Falchuk's "context presentation manager" 14 and "notifier" 16 components, "both individually and collectively." Pet. 33 (citing Ex. 1002 ¶ 89). And Facebook contends that the step of "sending a notification of context graph change" corresponds to "the process of reporting a notification to the context presentation manager in Falchuk and/or instructing the notifier to display the notification to the user." Pet. 32–33 (citing Ex. 1002 ¶ 89).

Facebook also contends that "[i]t would have been obvious to combine Cheng's system with Falchuk's teachings regarding adding, matching and providing notifications about goals." Pet. 33. According to Facebook, an ordinarily skilled artisan would have recognized in Falchuk "a clear benefit to the system of Cheng, *e.g.*, timely notifying its recommender about changes to the context graph that are meaningful to the user." Pet. 34 (citing Ex. 1002 ¶ 94). Specifically, Facebook points to a teaching in Cheng that, "[a]t a particular moment, what a user needs or likes and what is appropriate to suggest to the user can be highly variable based upon the

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user's situation," which suggests a motivation for using a recommender like in Falchuk that would allow such recommendations to be made in a timely manner as soon as the context graph changes. Pet. 35 (alteration in original) (quoting Ex. 1003 ¶ 10) (citing Ex. 1002 ¶ 94). Also, Facebook argues that incorporating Falchuk's recommender into Cheng's system would obviate any need for the user to request a recommendation explicitly, and allow the system to make recommendations at a time when "the user may not even realize . . . that they should request a recommendation." *Id.* (citing Ex. 1002 ¶¶ 94–96; Ex. 1004, 3:23–28).

PARC argues that limitation 1[c] requires a registration for the notification of changes relating to the context graph modification, and Falchuk's registration to trigger a reminder of a user's goal is not analogous to this. PO Resp. 32 (citing Ex. 2017 ¶¶ 98–103); *see also* PO Sur-reply 15–16 (arguing that "[e]ach step in the claims requires that the registration and notification be limited to the specific change to the particular aspect of the context graph that was modified in the earlier claim step").

In its Reply, Facebook argues that "this purported distinction is non-existent because, under the proposed combination, the notification in Falchuk is the direct result of the context graph change, such as a change in the user's location." Pet. Reply 13 (emphasis omitted) (citing Ex. 1004, 4:10–18). Facebook disagrees that claim 1 requires the recited "notification" must have any particular form or content, or that it "be limited to expressly reporting granular changes to particular aspects of a context graph, such as the simple fact of a change in user location." *Id.* at 14. According to Facebook, any notification triggered by a context graph change would meet limitation 1[c]. *Id.* (citing Ex. 1021 ¶¶ 33–34).

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We agree with Facebook that claim 1 does not impose any particular form or content on the notification of a context graph change. It simply recites "sending a notification of context graph change to a recommender." Ex. 1001, 10:39–40. It only expressly requires a notification of "context change" matching the registration, not any particular details or aspects of that change. Thus, by the plain claim language, any notification that alerts the recommender that the context graph has changed in a manner matching the registration is sufficient to meet limitation 1[c], whatever the content of that notification.

PARC also contends, in its Response, that Facebook has failed to carry its burden of showing, without the use of improper hindsight, that a person of ordinary skill in the art would have combined Cheng and Falchuk as Facebook asserts. PO Resp. 33–35. According to PARC, the motivation to provide a "timely recommendation" is insufficient to show obviousness because this assertion is too "generic" and "there is nothing in Cheng to suggest its recommendations are untimely such that it needs to be combined with Falchuk." *Id.* at 33–34 (citing Ex. 2017 ¶¶ 94–95; *TQ Delta*, 942 F.3d at 1363; *ActiveVideo Networks, Inc. v. Verizon Commc'ns, Inc.*, 694 F.3d 1312, 1328 (Fed. Cir. 2012) (determining that a generic assertion of efficiency was insufficient to show obviousness)); *see also* PO Sur-reply 16–17. PARC argues that "Cheng's recommendations are always timely because they are made with real-time, current data." PO Resp. 34 (citing Ex. 1003 ¶ 37; Ex. 2017 ¶¶ 94–95); *see also id.* at 35 (citing Ex. 2017 ¶¶ 94–97).

Facebook replies that PARC fails to address the drawback of Cheng, which Facebook identified in its Petition, that Cheng "does not disclose providing recommendations automatically, *i.e.*, without requiring that the

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user request them." Pet. Reply 14–15 (citing Ex. 1002 ¶ 95). Thus, Facebooks asserts, Cheng does not solve the problem that "the user may not even realize at [the time of the context graph change] that they should request a recommendation." *Id.* (quoting Pet. 35) (citing Ex. 1002 ¶¶ 94, 96). Moreover, Facebook argues that Cheng's disclosure of timely changes to the context graph has nothing to do with when the *recommendations* based on those changes are actually delivered, or whether those recommendations are timely. *Id.* at 15–16 (citing Ex. 1021 ¶ 29). Facebook also argues that "[a]n ordinarily skilled artisan would . . . have been motivated to combine with Falchuk simply because [Falchuk] provides far more detail than Cheng in how to implement a recommendation system." *Id.* at 16 (citing Pet. 27; Ex. 1002 ¶ 92; Ex. 1021 ¶¶ 29–30).

In its Sur-reply, PARC contends that Facebook's argument contradicts its previous position that Cheng already recognizes the importance of timeliness. PO Sur-reply 17 (citing Pet. 51; Ex. 1002 ¶ 137). PARC also argues that Cheng already discloses providing long-term and serendipitous recommendations based on current context data, and there is no evidence that Cheng is not automatic or that it requires the user to make an explicit request or a recommendation. *Id.* at 17–19 (citing Ex. 1003 ¶¶ 10, 37, 54; Ex. 2017 ¶¶ 94–97). PARC also characterizes as conclusory Facebook's argument that Falchuk provides more detail than Cheng about how to implement a recommender system. *Id.* at 19 (citing *ActiveVideo Networks*, 694 F.3d at 1327–28).

We agree with Facebook that Cheng provides little detail about how its recommender would interact with its personal interest graph, and we find persuasive Facebook's argument that a person of ordinary skill in the art

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would have had reason to look to other references, particularly Falchuk, to fill in the missing details. *See* Pet. 27. We do not regard Facebook's argument as conclusory or as relying on improper hindsight because Facebook articulates a persuasive reason for the combination that relies only on the prior art teachings and not on the '439 patent itself. *See In re McLaughlin*, 443 F.2d 1392, 1395 (CCPA 1971) (A prior art combination is not improper hindsight "so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made and does not include knowledge gleaned only from applicant's disclosure."). We also disagree with PARC's suggestion that, to meet its burden of showing obviousness, Facebook necessarily needs to show that there was a known deficiency in Cheng. *See Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1002-03 (Fed. Cir. 2016) (A patent challenger "does not need to show that there was a known problem with the prior art system in order to articulate the required rational underpinning for the proposed combination.").

By a preponderance of the evidence, Facebook has shown that the combination of Cheng and Falchuk teaches limitation 1[c], and has sufficiently articulated a reason why a person of ordinary skill would have modified Cheng by incorporating Falchuk's system for providing goal-based recommendations associated with changes in Cheng's personal interest graph.

6. *Conclusion as to Claim 1*

For all reasons discussed in the sections above, we determine that Facebook has shown by a preponderance of the evidence that claim 1 is unpatentable as obvious over Cheng in view of Falchuk.

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D.   CLAIMS 2–4, 7–10, 13–16, AND 20

Independent claims 7 and 13 are directed to a "computer-readable storage medium" and a "computing system," respectively, that implement essentially the same method as claim 1. *Compare* Ex. 1001, 10:30–40, *with id.* at 11:1–13, *and id.* at 11:47–12:7. For these claims, Facebook relies substantially on its arguments for claim 1. *See* Pet. 44–46 (claim 7) (citing Ex. 1001, 10:60–11:2; Ex. 1002 ¶¶ 113–115; Ex. 1003 ¶¶ 40, 55, 57, 58); Pet. 46–47 (claim 13) (citing Ex. 1002 ¶ 123; Ex. 1003 ¶ 57).

Claims 2, 8, and 14 depend from independent claims 1, 7, and 13, respectively, and further recite the following additional steps: (a) "receiving, from the mobile device, additional event data including application event data and/or operating system event data;" (b) "modifying the context graph based on the additional event data;" (c) "determining that the modification to the context graph matches the registration;" and (d) "sending a second notification of context graph change to the recommender." Ex. 1001, 10:41–50 (claim 2); *accord id.* at 11:14–26 (claim 8); *id.* at 12:8–20 (claim 14). Essentially, these claims repeat the steps of claim 1 except with regard to "additional event data including application event data and/or operating system event data." *Id.* at 10:42–44. For these limitations, Facebook relies on Cheng and Falchuk in an analogous way to that discussed above in the context of claim 1. *See* Pet. 36–40, 46, 47.

Claims 3, 9, and 15 depend from claims 1, 7, and 13, respectively, and further recite that "the event data includes high-level event data generated by the mobile device from contextual data." Ex. 1001, 10:51–53 (claim 3); *accord id.* at 11:27–29 (claim 9); *id.* at 12:21–23 (claim 15). For these claims, Facebook relies on the disclosure in Cheng of two levels of event

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data derived from the contextual data, one of which is the result of a data fusion step which, according to Facebook, corresponds to the recited "high-level event data." *See* Pet. 40–43 (citing Ex. 1001, 4:45–48; Ex. 1002 ¶¶ 108–109; Ex. 1003 ¶¶ 40, 42, 55, Fig. 2).

Claims 4, 10, and 16 depend from claims 1, 7, and 13, respectively, and further recite steps of "receiving a query for context graph data from the recommender; and sending the context graph data to the recommender." Ex. 1001, 10:54–57 (claim 4); *accord id.* at 11:30–34 (claim 10); *id.* at 12:24–30 (claim 16). Facebook contends that "Cheng makes clear that a recommender application queries a personal interest graph for data" and argues that "[b]ecause the query for the context graph data comes from the recommender, as noted, it is the recommender that receives that data in response to its query." Pet. 43–44 (citing Ex. 1002 ¶¶ 111–112; Ex. 1003 ¶¶ 34, 54–56); Pet. 46 (claim 10); Pet. 47 (claim 16).

Claim 20 depends from claim 1 and further recites "wherein sending the notification comprises notifying the recommender of topological changes in the context graph and/or changes to individual properties of nodes and edges in the context graph." Ex. 1001, 12:52–55. Facebook relies essentially on its arguments for claim 1, and particularly limitation 1[c]. Pet. 47; *see supra* part IV.C.5. Facebook also argues that "[b]ecause concepts are represented as nodes in the personal interest graph, a skilled artisan would have understood that adding a node for a new concept based on usage activity data would result in a topological change to the graph." *See* Pet. 48–49 (citing Ex. 1003 ¶ 45). Thus, according to Facebook, "[a] notification associated with such an update . . . would comprise notifying the recommender of topological changes in the personal interest graph and/or

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changes to the individual properties of nodes in the personal interest graph."
Pet. 49 (citing Ex. 1002 ¶ 133).

PARC does not contest Facebook's specific showing for claims 2–4,
7–10, 13–16, or 20. *See generally* PO Resp. We find those arguments
persuasive, and credit Mr. Schmandt's supporting testimony. For all the
reasons above, we find Facebook's arguments persuasive that Cheng, in
view of Falchuk, teaches all the limitations in these claims and that a person
of ordinary skill in the art would have had reason to combine Cheng with the
teachings of Falchuk. Thus, we determine that Facebook has shown by a
preponderance of the evidence that claims 2–4, 7–10, 13–16, and 20 are
unpatentable as obvious over Cheng in view of Falchuk.

E.   CLAIMS 5, 11, AND 17

Claims 5, 11, and 17 depend from claims 1, 7, and 13, respectively,
and further recite "receiving real-time event data through a RESTful
WebAPI; and modifying the context graph based on the received real-time
event data." Ex. 1001, 10:58–62; *accord id.* at 11:35–40; *id.* at 12:31–38. In
its second ground, Facebook argues that "[b]oth Cheng and Falchuk disclose
web-based systems, although neither explicitly describes the use of a
RESTful WebAPI." Pet. 53 (citing Ex. 1003 ¶¶ 31, 40). However, Facebook
argues that a person of ordinary skill in the art would have modified the
Cheng–Falchuk combination by incorporating Richardson's teachings about
using of a RESTful WebAPI for receiving real-time event data in the context
of Amazon's S3 cloud storage service. *See* Pet. 49–54, 57–58 (citing
Ex. 1001, 4:60–64, 5:9–14, 5:16–17, 5:62–67, 7:18–21, 9:19–21; Ex. 1002
¶¶ 114–115, 123, 136–142, 151–156; Ex. 1003 ¶¶ 7, 10, 31, 40, 53, 54;

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Ex. 1004, 2:5–9, 3:46–48, 4:10–23, 4:56–58, 5:23–24, 7:12–21; Ex.
1005, 36, 45–73). According to Facebook, incorporating the teachings of
Richardson into the Cheng–Falchuk combination would have been a "clear
and straightforward" combination motivated by the desire "to use an
existing, well-established storage service in order to save on implementation
and maintenance costs—and Amazon's S3 is one of the most well-known
'cloud' storage services." Pet. 55 (citing Ex. 1002 ¶ 147; Ex. 1003 ¶ 40, 55;
Ex. 1005, 36). Facebook also contends that "an ordinarily skilled artisan
would have been motivated to use a RESTful WebAPI to harness an industry
standard and technologically mature technology." Pet. 55–56 (citing
Ex. 1002 ¶ 148).

PARC does not dispute Facebook's specific showing for claims 5, 11,
or 17. *See generally* PO Resp. We find those arguments persuasive, and
credit Mr. Schmandt's supporting testimony. For all the reasons above, we
find Facebook's arguments persuasive that Cheng, in view of Falchuk and
Richardson, teaches all the limitations in these claims and that a person of
ordinary skill in the art would have had reason to combine Cheng with the
teachings of Falchuk and Richardson. Thus, we determine that Facebook has
shown by a preponderance of the evidence that claims 5, 11, and 17 are
unpatentable as obvious over Cheng in view of Falchuk and Richardson.

F.   CLAIM 19

Claim 19 depends from claim 1 and further recites "sending a second
notification to the recommender by pushing events into the recommender's
publish/subscribe system asynchronously using a long-poll persistent push
connection." Ex. 1001, 12:47–51. For its third ground challenging claim 19,

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Facebook relies on the arguments for claim 1, and also argues that the combination of Cheng and Falchuk would send a second notification to the combined recommender by "pushing" events into the system, which according to Facebook "generally refers to providing information automatically without requiring a user to make a specific request for ('pull') it." Pet. 59 (citing Ex. 1002 ¶ 159; Ex. 1010, 13; Ex. 1011, 9).

Facebook also contends that "the '439 patent makes clear that 'publish/subscribe' is a known software design pattern—i.e., a general, reusable solution to a commonly occurring problem within a given context in software design." Pet. 60 (citing Ex. 1001, 4:49–51, 7:54–60, 8:4–9; Ex. 1006, 69–83; Ex. 1011, 8; Ex. 1002 ¶ 160). According to Facebook, "[a] person of ordinary skill would have understood Falchuk's technique of entering goals into its system and then automatically providing related notifications to a recommender at a later time to involve a 'publish/subscribe' system." Pet. 60–61 (citing Ex. 1002 ¶ 161). In other words, "a recommender is 'subscribed' to receive notifications about certain events by entering a goal into the system. Notifications are then 'published' to the recommender at a later time when they are reported to the recommender." Pet. 61 (citing Ex. 1002 ¶ 161).

Facebook also relies on Shalloway as teaching a push-based notification system, and on Powell for teaching that the push notification would be performed "asynchronously using a long-poll persistent push connection." *See* Pet. 58–67 (citing Ex. 1001, 4:49–51, 7:54–60, 8:4–9; Ex. 1002 ¶¶ 158–161, 164–168, 170–176; Ex. 1003 ¶¶ 31, 40, 55, 56; Ex. 1004, 3:46–48, 4:56–58, 6:15–21; Ex. 1006, 69–83; Ex. 1007, 19, 65–68; Ex. 1010, 5, 13; Ex. 1011, 5–6, 8–9).

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According to Facebook, a person of ordinary skill in the art would have had reason to use Shalloway's push-based notification system because Cheng and Falchuk already teach such a system, and Shalloway would have provided "software design techniques and practices when implementing that functionality." Pet. 62 (citing Ex. 1002 ¶ 166). Facebook also contends that Shalloway teaches that a publish/subscribe pattern "is a very common one," and provides its own motivations for using one, such as that it decouples notifiers from notifyees, and "adds flexibility to a system to better adapt to future system changes." Pet. 62–63 (citing Ex. 1006, 72–73; Ex. 1002 ¶ 167).

Facebook also contends that the use of a long-poll persistent push connection "again simply describes well-known software techniques and is not an invention of the '439 patent." Pet. 63. According to Facebook, Powell teaches that such techniques are a good way to implement highly responsive web applications. Pet. 63–64 (citing Ex. 1007, 19, 65–68; Ex. 1002 ¶ 170). Facebook argues that Cheng and Falchuk describe such systems, and thus a person of ordinary skill in the art would have turned to Powell's teachings to implement such a system using an asynchronous long-poll persistent push connection. Pet. 65–66 (citing Ex. 1003 ¶¶ 31, 40, 56; Ex. 1004, 3:46–48, 4:56–58)

In its Response, PARC argues that a "publish/subscribe system" is an established term of art which does not correspond to how Facebook interprets the term. PO Reply 36–37 (citing Ex. 1006, 73; Ex. 2017 ¶¶ 104–105). PARC contends that Facebook does not explain, in a non-conclusory way that does not rely on improper hindsight, how a person of ordinary skill

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in the art would have combined Cheng and Falchuk with Shalloway and Powell. *Id.* at 37; *see also* PO Sur-reply 20.

PARC also contends that there would have been no motivation to combine Powell with Cheng and Falchuk because Falchuk's alleged recommender "runs on a mobile device client, not a web browser" as Powell teaches. PO Resp. 38–39 (citing Ex. 2017 ¶¶ 107–121). According to PARC, "Cheng does not remedy this deficiency" because it relies on information gathered from hardware devices, so a person of ordinary skill in the art "would not understand Cheng's recommender to be a web browser." *Id.* at 39 (citing Ex. 2017 ¶ 114); *see also* PO Sur-reply 21–23 (arguing that Facebook has not shown that one would use Powell's teachings in a non-web-browser environment). PARC also argues that Powell teaches that there are "limitations and problems presented by a long-poll technique," such as that "[h]eld connections and some Web server application server architectures may not get along well," or that there may be a "gap of no connectivity when browser re-establishes connection after data transfer or timeout." PO Resp. 39 (quoting Ex. 1007, 66). According to PARC, Powell also mentions possible scalability problems which may require "moving operations outside of the web browser/server environment." *Id.* at 39–40 (citing Ex. 1007, 77–78; Ex. 2017 ¶ 119). PARC contends that a person of ordinary skill in the art would have used a simpler alternative to that disclosed in Powell. *Id.* at 40 (citing Ex. 2017 ¶ 120).

In its Reply, Facebook argues that PARC has not clearly explained why there is a problem with Facebook's understanding of a "publish/subscribe system." Pet. Reply 17. According to Facebook, Dr. Martin's definition of such a system on cross-examination is substantially

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the same as the definition in a technical dictionary cited in the Petition, which is a "communication paradigm in which one party (e.g. person or computer program) releases data and notifies a list of interested recipients called subscribers that it is available." *Id.* (quoting Ex. 1011, 8) (citing Ex. 1018, 15:19–16:12; Ex. 1021 ¶ 36). Facebook also argues that claim 19 does not require any particular entity or component to perform the act of subscribing or the acts of sending notification or pushing events. *Id.* at 18–19.

As to the proposed motivation to combine, Facebook contends that PARC does not dispute that Powell discloses a long-poll persistent push contention as recited in claim 19. Pet. Reply 19. Facebook disagrees with PARC that Powell's teachings are limited to a web-browser environment, but even if it did, Facebook argues that Falchuk teaches an embodiment that runs on the web browser of a mobile device. *Id.* at 20 & n.3 (citing Ex. 1004, 4:56–58). Facebook also disagrees with PARC that Powell discourages the use of a long-poll technique, because Powell merely teaches (at the very end of a 15-page discussion) that there are tradeoffs in using the technique, as well as solutions to the problems. *Id.* at 20–22 (citing Ex. 1007, 63–78; Ex. 1021 ¶¶ 43, 46). In particular, according to Facebook, "Powell emphatically explains that HTTP long-polling is preferable over alternative approaches that require continuously checking the status of the server at regular intervals," which would be inefficient for "irregularly occurring events such as those in the Cheng/Falchuk system." *Id.* at 21–22 (citing Ex. 1007, 63–64; Ex. 1021 ¶ 45). Thus, Facebook contends that the problems identified in Powell fail to rise to teaching away.

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We find Facebook's arguments persuasive, and we credit the supporting testimony of Mr. Schmandt. As to the recited "publish/subscribe system," the parties appear to agree that such systems are well-known in the art. In particular, we find persuasive Facebook's argument that Cheng, in view of Falchuk, already teaches such a system, and that a person of ordinary skill in the art would have looked to Shalloway for implementation details. *See* Pet. 62; Ex. 1002 ¶ 166.

As to pushing "asynchronously using a long-poll persistent push connection," it appears to be undisputed that Powell teaches such a connection. We agree with Facebook that Powell's teachings are not limited only to a web-browser environment, but even if they were, we agree that Falchuk teaches an embodiment that operates on a web browser. *See* Ex. 1004, 4:56–58. We also agree with Facebook that Powell's discussion of problems and limitations of a long-pull persistent push connection do not rise to the level of teaching away, because Powell teaches both drawbacks and benefits of such a system. *See* Ex. 1007, 63–78. We credit the testimony of Mr. Schmandt that the benefits outweigh the drawbacks and that it would have been within the ordinary level of skill in the art to overcome the known problems in incorporating the use of long-poll persistent push connections into the Cheng–Falchuk combination. *See* Ex. 1021 ¶¶ 43–47.

For all reasons discussed above, we determine that Facebook has shown by a preponderance of the evidence that claim 19 is unpatentable as obvious over Cheng in view of Falchuk, Shalloway, and Powell.

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V. PARC'S CONTINGENT MOTION TO AMEND

Because we conclude that all of the challenged claims are unpatentable based on the grounds of the Petition, we consider PARC's Contingent Motion to Amend. *See* MTA (Paper 13) 1 (stating that the Motion to Amend is contingent on if "the Board finds any of the original claims 1–20 unpatentable"). Although PARC originally submitted proposed substitute claims 21–40 to replace original claims 1–20, PARC has withdrawn proposed substitute claims 26, 32, and 38. *See* PO Reply MTA 1.

For the reasons below, we find that each of pending proposed substitute claims 21–25, 27–31, 33–37, 39, and 40 would introduce new matter, and that they are unpatentable under § 103. Therefore, we deny the Contingent Motion to Amend.

A. PROPOSED SUBSTITUTE CLAIMS

PARC proposes claims 21–25, 27–31, 33–37, 39, and 40 as substitutes for original claims 1–5, 7–11, 13–17, 19, and 20 of the '439 patent, respectively. *See* MTA App'x A. Proposed substitute claim 21 is reproduced below, with underlining to indicate the text proposed to be added to original claim 1:

> 21. (Proposed substitute for claim 1, if found unpatentable) A method, comprising:
>
> [a] receiving, from a mobile device, event data derived from contextual data collected using detectors that detect a physical context surrounding the mobile device;
>
> [b] <u>aggregating the event data from multiple mobile device clients for analysis, at a server-side architecture, regarding co-location events;</u>

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> [c] modifying a context graph that stores facts and assertions about a user's behavior and interests using the event data, <u>wherein the context graph includes nodes shared between two or more users;</u>
>
> [d] in response to determining, <u>at the server-side architecture,</u> that there exists a registration for notification of changes that matches the modification to the context graph, sending, <u>by the server-side architecture,</u> a notification of context graph change to a recommender.

MTA App'x 1 (PARC's reference letters added, and formatting added for consistency with the original claims). PARC proposes similar amendments in proposed substitute independent claim 27, corresponding to original claim 7 (*id.* at 3–4) and proposed substitute independent claim 33, corresponding to original claim 13 (*id.* at 5–6).

B. PARC's Burden to Show Compliance with Statutory and Regulatory Requirements

We first consider whether PARC has met its burden to show that it has met the statutory and regulatory requirements for a motion to amend. "Before considering the patentability of any substitute claims, . . . the Board first must determine whether the motion to amend meets the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121." *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 at 4 (PTAB Feb. 25, 2019) (precedential). Accordingly, a patent owner must make a claim listing reproducing each proposed substitute claim (which it has, *see* MTA App'x A), and must make an initial showing to demonstrate the following: (1) the amendment proposes a reasonable number of substitute claims; (2) the amendment responds to a ground of unpatentability involved in the trial; (3) the amendment does not seek to enlarge the scope of the claims of the patent; and (4) the proposed claims are supported in the

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original disclosure (and any earlier filed disclosure for which the benefit of
filing date is sought) without introducing new subject matter. *See* 35 U.S.C.
§ 326(d); 37 C.F.R. § 42.121.

> 1.   *Whether There Is a Reasonable Number of Substitute*
> *Claims and Whether the Proposed Amendment Responds*
> *to a Ground of Unpatentability Involved in the Trial*

PARC contends that it has proposed a reasonable number of substitute
claims and that the proposed amendments respond to the patentability
grounds involved in this trial. *See* MTA 2–3. In its Opposition, Facebook
pointed out that proposed substitute claims 26, 32, and 38 corresponded to
claims that were not challenged in this proceeding. Pet. Opp. MTA 1–2.
PARC responded by withdrawing claims 26, 32, and 38 from its Contingent
Motion to Amend. PO Reply MTA 1.

Apart from the issue addressed by PARC's withdrawal of proposed
claims 26, 32, and 38, Facebook does not otherwise challenge the number of
proposed claims or whether the proposed amendments respond to issues
involved in the trial. *See* Pet. Opp. MTA 1–2; *see generally* Pet. Sur-reply
MTA. Because of this withdrawal, PARC now only proposes one substitute
claim per original claim challenged in the Petition, which is reasonable. And
we determine that these proposed amendments respond to issues raised in
the Petition.

> 2.   *Whether the Proposed Amendment Seeks to Enlarge the*
> *Scope of the Original Claims*

PARC alleges that its "proposed substitute claims retain all of their
original features and add narrowing elements." MTA 4. However, Facebook
contends that proposed substitute independent claims 27 and 33

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impermissibly broaden original claims 7 and 13, respectively. Pet. Opp.

MTA 2–3. Proposed substitute claim 27 amends the final limitation of

original claim 7 as follows:

> in response to determining, at the server-side architecture, that there
> exists a registration for notification of changes that matches the
> modification to the context graph, sending, by the server-side
> architecture, a notification of context graph change to a
> recommender.

MTA App'x 3–4 (formatting added consistent with the original claim

limitation). Proposed substitute claim 33 includes a similar amendment to

original claim 13. *See id.* at 6.

Facebook argues that because of the addition of "by the server-side

architecture" in these two claims (a requirement that carries over into

dependent claims 28–32 and 34–38), the claims "no longer require that the

"sending . . . a notification" and "determining" steps be performed by the

'instructions' on the 'computer-readable storage medium'" because, instead,

a "'server-side architecture' now performs these steps, which could be the

same device or an entirely separate device from the one that has the claimed

'computer-readable storage medium.'" Pet. Opp. MTA 3 (emphasis omitted).

PARC disagrees. According to PARC, proposed substitute claims 27

and 33 "recite 'a' computer-readable medium, which 'carries the meaning of

'one or more' in the open-ended claims containing the transitional phrase

'comprising.'" PO Reply MTA 1–2 (quoting *SanDisk Corp. v. Kingston*

Tech. Co., 695 F.3d 1348, 1360 (Fed. Cir. 2012)) (citing Ex. 2024 ¶¶ 63–65).

PARC argues that "[t]he fact that some or all of the computer readable

medium/instructions may be at server-side architecture does not render the

substitute claims broader than the originals, which have no limitation on

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where—or how many—computer readable mediums operate to execute the instructions." *Id.* at 2 (citing Ex. 2024 ¶¶ 63–65).

Facebook replies that under the proposed amendments, "the 'server-side architecture' . . . need not have any relationship to any computer-readable storage medium recited in the claim," so that, "unlike original claims 7 and 13, the 'determining' and 'sending a notification' steps no longer have to be performed by the claimed computer-readable storage medium, regardless of whether the medium comprises one, two, or ten thousand devices." Pet. Sur-reply MTA 1–2 (emphasis omitted).

We disagree. First, we note that Facebook's argument does not appreciate that, as recited in original claims 7 and 13 and proposed substitute claims 27 and 33, it is the "computer" or the "processors," respectively, not the "non-transitory computer-readable medium," that actually perform the "determining" and "sending . . . a notification" steps. *See* MTA App'x 3 ("instructions that when executed by the computer cause *the computer to perform* a method, the method comprising . . ."), *id.* at 6 ("instructions stored [on the medium] that, when executed by the one or more processors, cause *the one or more processors to perform* operations comprising . . ."). We raised this point in our Preliminary Guidance, and expressed our preliminary view that "[t]he claims and the supporting specification do not appear to restrict the type of 'computer' that the method can be run on, including a server or other computer that is part of a server-side architecture." Paper 25, 5 (citing Ex. 2020 ¶¶ 23, 33, 36, 37, 40, 41, 43, 63, Fig. 3; Pet. 45–46).

Thus, the question we must consider is whether PARC's limitation of the processing hardware that performs the "determining" and "sending" steps to the "server-side architecture" broadens the original claims, which do

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not specify the location of the computer or processors, including whether they are part of a server-side architecture, a client-side architecture, or some combination of the two. Although PARC's argument focuses on the location of the medium, rather than the computer or processors, PARC's argument is valid that original claims 7 and 13 do not specify the location of the recited processing steps, or whether the steps take place in multiple locations (e.g., by a distributed system). [12] *See* PO Reply 2. *Id.* at 2.

The proposed amended claims would simply limit the location of the processing hardware performing the "determining" and "sending" steps *solely* to the server-side architecture. Because this narrows the original claims, we determine that PARC's proposed amendment does not seek to enlarge the scope of the original claims.

3. Whether the Proposed Amendment Introduces New Matter

We next consider whether the proposed substitute claims (including material found in the original claims) are supported in the original disclosure and whether the proposed amendment introduces new matter in violation of 35 U.S.C. § 316(d)(3). New subject matter is any addition to the claims that lacks sufficient support in the subject patent's original disclosure. *See TurboCare Div. of Demag Delaval Turbomach. v. Gen. Elec. Co.*, 264 F.3d 1111, 1118 (Fed. Cir. 2001) ("When [an] applicant adds a claim . . . , the new

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[12] Facebook points out a practical difficulty that would occur if PARC tried to enforce the proposed substitute claims against a system with client and server parts operated by two distinct parties, as no single party would satisfy all the claim limitations. *See* Pet. Sur-reply MTA 2. This is a separate issue from the question before us of whether the proposed amendments seek to enlarge the scope of the original claims.

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claim[] must find support in the original specification."). The Board requires that a patent owner show in a motion to amend that there is written-description support in the originally filed disclosure of the subject patent for each proposed substitute claim, and also set forth support in an earlier-filed disclosure for each claim for which the patent owner seeks the benefit of the earlier-filed disclosure's filing date. *See* 37 C.F.R. §§ 42.121(b)(1), 42.121(b)(2).

The test for determining whether an amendment lacks written description support in the original disclosure is not simply the presence or absence of literal support in the disclosure for the claim language, but rather, whether the disclosure as originally filed reasonably conveys to a person of ordinary skill in the art that the inventor had possession of the claimed subject matter at the time of filing. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc); *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563 (Fed. Cir. 1991); *In re Kaslow*, 707 F.2d 1366, 1375 (Fed. Cir. 1983).

In its Motion to Amend, PARC contends that "the proposed substitute claims are supported in the original non-provisional application and thus do not introduce new subject matter." MTA4. As support, PARC provides the testimony of Dr. Martin including a table that purportedly shows where support for each limitation may be found in the non-provisional parent application, App. No. 13/873,061 ("the '061 application," Ex. 2020). MTA5 (citing Ex. 2017 ¶¶ 53–60). PARC also provides an outline of this support in its Contingent Motion to Amend. MTA5–8.

Facebook contends that the proposed substitute claims lack support for the limitation "wherein the context graph includes nodes shared between

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two or more users" in proposed substitute independent claims 21, 27, and 33 and in the other proposed substitute claims through dependency. *See* Pet. Opp. MTA 12–13. Facebook argues that "[t]he only potential support in the originally-filed specification for this new limitation appears to be a single sentence that merely states: 'Note that context graphs can also be shared between users.'" *Id.* (quoting Ex. 2020 ¶ 49). According to Facebook, "[t]his statement does not state that individual *nodes* of a context graph can be shared." *Id.* at 13. This difference is significant, Facebook argues, because "an ordinarily skilled artisan would have interpreted the statement about sharing context graphs as describing the ability of a user to share their context graph with other users, for example, by granting other users access to access to information in the graph." *Id.* (citing Ex. 1021 ¶¶ 62–64). But according to Facebook, "this statement does not disclose that underlying *nodes* within a context graph are shared between multiple users." *Id.* (citing Ex. 1021 ¶ 63).

PARC replies that the '061 application "explains that (1) "[e]ach user is associated with a context graph," (2) "context graphs can also be shared between users[,]" and (3) "context graphs with greater numbers of nodes [can be managed] using cross module interconnections." PO Reply MTA 8 (alterations in original) (quoting Ex. 2020 ¶¶ 48–49) (citing Ex. 2024 ¶¶ 74–81). Based on these disclosures, PARC contends that a person of ordinary skill in the art would have understood "that each user has his/her own context graph, but that nodes may be shared using known data structure sharing techniques." *Id.* (citing Ex. 2024 ¶¶ 82–88). According to PARC, this is because duplicate nodes for different users would be stored in the same memory location to minimize storage space, and using cross-module

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interconnections, the system would distribute nodes for large graphs across multiple software modules on different devices. *See id.* (citing Ex. 2024 ¶¶ 90–90, 98–99).

Facebook counters that PARC "does not explain how the brief mention of 'cross module interconnections' provides any support for sharing of nodes in a context graph between two or more users." Pet. Sur-reply MTA 7. Because "[t]he term 'module' merely refers to hardware and/or software for carrying out the invention," the disclosure of cross-module interconnections, "at best, merely describes a feature for scaling the system to handle more nodes by allowing interconnections between the various hardware and/or software modules used to carry out the alleged invention." *Id.* at 7–8 (emphasis omitted) (citing Ex. 1001, 7:41–43, 10:11–20; Ex. 2020 ¶¶ 49, 66). According to Facebook, "[c]ross module interconnections have nothing to do with sharing individual nodes of context graphs between two or more users." *Id.* at 8 (emphasis omitted).

We agree with Facebook. At best, PARC's arguments go to whether the sharing of nodes would have been obvious in view of the disclosure in the '061 application. Although "the description requirement does not demand any particular form of disclosure, . . . a description that merely renders the invention obvious does not satisfy the requirement." *Ariad Pharms.*, 598 F.3d at 1352 (citing *Carnegie Mellon Univ. v. Hoffmann–La Roche Inc.*, 541 F.3d 1115, 1122 (Fed. Cir. 2008); *Lockwood v. Am. Airlines*, 107 F.3d 1565, 1571–72 (Fed. Cir. 1997)).

Thus, we find that PARC has failed to show support in the original disclosure for the added phrase "wherein the context graph includes nodes shared between two or more users." Consequently, we find that each of the

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proposed substitute claims would introduce new matter, and the amendments are disallowed under 35 U.S.C. § 316(d)(3).

C.   PATENTABILITY OF THE PROPOSED SUBSTITUTE CLAIMS

Having considered whether PARC has met its statutory and regulatory burden for a motion to amend, we next consider whether the record as a whole shows that the proposed substitute claims are patentable.

"A petitioner bears the burden of persuasion to show, by a preponderance of the evidence, that any proposed substitute claims are unpatentable." 37 C.F.R. § 42.121(d)(2); *see also Bosch Automotive Service Solutions, LLC v. Matal*, 878 F.3d 1027, 1040 (Fed. Cir. 2017), *amended by Bosch Automotive Service Solutions, LLC v. Iancu*, No. 2015-1928 (Fed. Cir. Mar. 15, 2018). To determine whether a petitioner has proven the substitute claims are unpatentable, the Board focuses on "arguments and theories raised by the petitioner in its petition or opposition to the motion to amend." *Nike, Inc. v. Adidas AG*, 955 F.3d 45, 51 (Fed. Cir. 2020). The Board itself also may justify any finding of unpatentability by referring to evidence of record in the proceeding. *Lectrosonics*, Paper 15 at 4 (citing *Aqua Products v. Matal*, 872 F.3d 1290, 1311 (Fed. Cir. 2017) (O'Malley, J.)).

Facebook contends that each of the proposed substitute claims is unpatentable under 35 U.S.C. §§ 101, 103, 112(a), and 112(b). Pet. Opp. MTA 3–25. The table below is a summary of the unpatentability grounds Facebook advances in its Opposition to the Contingent Motion to Amend:

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Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
21–25, 27–31, 33–37, 39, 40[13]	112(a)	Written Description
21–25, 27–31, 33–37, 39, 40	112(b)	Indefiniteness
21–25, 27–31, 33–37, 39, 40	101	Eligibility
21–24, 27–30, 33–36, 40	103	Cheng, Falchuk, Tseng[14]
25, 31, 37	103	Cheng, Falchuk, Richardson, Tseng
39	103	Cheng, Falchuk, Shalloway, Powell, Tseng

Of the above grounds, we only address those based on § 103, which are
sufficient to show unpatentability of all the proposed substitute claims.[15] We
note that Facebook's arguments under § 112(a) overlap with the discussion
above about whether PARC's proposed amendment complies with 35 U.S.C.
§ 316(d)(3), and we do not further address this ground. *See supra* Section
V.B.3.

> 1.   *Obviousness of Proposed Substitute Claims 21, 27, and
>   33 over Cheng, Falchuk, and Tseng*

In addition to its prior arguments regarding original claims 1, 7, and
13, Facebook contends that corresponding proposed substitute claims 21, 27,

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[13] Proposed substitute claims 26, 32, and 38 have been withdrawn, and we
do not consider them in our analysis. *See* PO Reply MTA 1.

[14] Tseng et al., US 2012/0166432 A1 (published June 28, 2012) (Ex. 1020).

[15] Facebook state that, "[w]ith respect to limitations that were not amended,
the analysis from the Petition remains applicable." Pet. Opp. MTA 13. We
incorporate our analysis above with respect to these limitations. *See supra*
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and 33 are unpatentable under § 103 as obvious over Cheng, Falchuk, and Tseng. Pet. Opp. MTA 13–22. We address Facebook's arguments below.

(a)   Overview of Tseng

Tseng describes a social networking system that "provides relevant third-party content objects to users by matching user location, interests, and other social information with the content, location, and timing associated with the content objects." Ex. 1020, code (57). The location data is provided by mobile devices. *See id.* ¶ 27.

Figure 8a, depicted below, is part of "a series of sample screenshots illustrating how a client device may display a ranked list of search results to a user of [the disclosed] social networking system, where the search results are presented based on the user's location and social information" (Ex. 1020 ¶ 13):
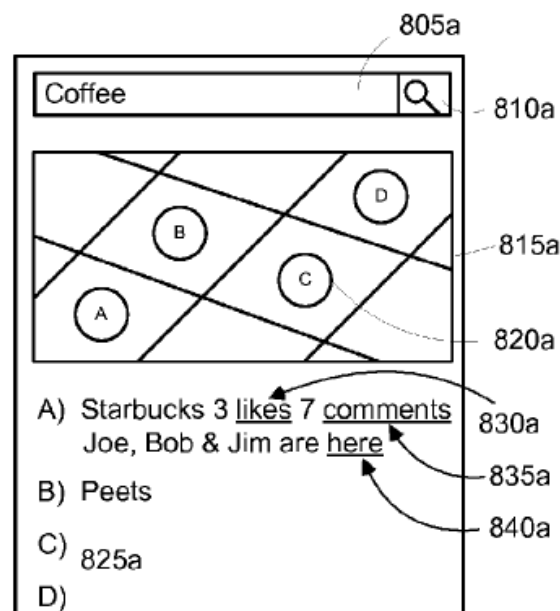

FIG. 8a

Figure 8a, above, "is a sample screenshot of how a context search query 805*a* for coffee may be displayed." Ex. 1020 ¶ 120. The image shows the

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word "Coffee" in search bar 805*a*, and below that, graphical map 815*a*
showing coffee locations A, B, C, and D (820*a*), which, below that, are also
"listed 825*a* in order according to their relevance scores." *Id.* List 825*a*
labels location A as "Starbucks" and indicates that there are "3 likes" (830*a*)
and "7 comments" (835*a*), and indicates that social connections (840*a*) "Joe,
Bob & Jim are here." Location B is labeled "Peets," but does not indicate the
presence of any likes, comments or social contacts.

(b)   Amendments Regarding "Co-Location Events"

Facebook contends that Cheng teaches the added limitation
"aggregating the event data from multiple mobile device clients for analysis,
at a server-side architecture, regarding co-location events." Pet. Opp. MTA
14–15. According to Facebook, Tseng teaches the use of location data from
social contacts to determine the relevance of search queries, and this
relevance takes into consideration whether there are contacts at the location
of interest. *See* Pet. Opp. MTA 16–18 (citing Ex. 1020 ¶¶ 17–18, 27, 44, 51,
106, 109, 111, 115, 118, 120–122, 128, 145–148, Figs. 8a–d; Ex. 1021
¶¶ 84–85). According to Facebook, a person of ordinary skill in the art
would have had reason to incorporate Tseng's co-location teachings into
Cheng's system because the resulting "recommendations would have taken
into account the proximity of the user to other users and thus provid[e] an
opportunity for social interaction." *Id.* at 19 (citing Ex. 1020 ¶ 115; Ex. 1021
¶¶ 89–90).[16]

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[16] Facebook alternatively argues that Cheng, alone, teaches the "co-location
events" limitation. *See* Pet. Opp. MTA 14–15. We need not address this
argument because we determine that Cheng teaches this limitation in light of
the teachings of Tseng.

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PARC responds that "Cheng determines proximity through 'social sensors and a microphone,' not through location information." PO Reply MTA 11 (citing Ex. 1003 ¶ 42). According to PARC, the Cheng–Tseng combination would have used Cheng's sensors, which "only consider[] whether the user is alone or with friends as determined by the social sensors and microphone, not *where* the user(s) are located." *Id.* (citing Ex. 1003, Fig. 8; Ex. 1021 ¶ 82; Ex. 2024 ¶¶ 117–118, 123–126). PARC also argues that "Cheng analyzes data at the client device, not server-side architecture." *Id.* (citing Ex. 1003 ¶ 55).

Facebook disagrees that Cheng only determines location based on social sensors and a microphone, because "Cheng clearly discloses using GPS to determine user location." Pet. Sur-reply 8 (citing Pet. 13–14; Ex. 1003 ¶¶ 32, 35). Facebook also disagrees that, in the proposed combination, the aggregation of event data would take place at the client side, because Facebook relies on Tseng for aggregating the location data, on the server side, obtained from Cheng's location sensors. *See id.* at 8–9 (citing Pet. Opp. MTA 16–19).

We find Facebook's arguments persuasive because we agree that Cheng teaches the use of GPS sensors to determine location, and the evidence suggests that a person of ordinary skill in the art would have had reason to use Tseng's system to aggregate that location data, on the server side, to determine when social contacts are co-located within the same area of interest.

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      (c)   <u>Amendments Regarding Sharing Nodes Between Two or More Users</u>

Facebook contends that Cheng discloses a context graph in which nodes are shared because "multiple users who express interest in the same concepts will have links to the same corresponding concept nodes in the global ontology." Pet. Opp. MTA 20 (citing Ex. 1003 ¶¶ 46, 51; Ex. 1021 ¶ 92). [17]

PARC disagrees that "links to Cheng's social graph can satisfy the 'shared nodes' element." PO Reply MTA 12. According to PARC, "Cheng's social graph is a multi-user graph rather than a per-user graph as required by a proper construction of the term 'context graph.'" *Id.* (citing Ex. 2024 ¶ 120). PARC contends that "[e]ach node in Cheng's social graph is a person, which results in a multi-user graph," so "[a] personal interest graph that links to this multi-user social graph results in a multi-user interest graph, which fails to comply with both parties' understanding of the term 'context graph'" as being "per-user." *Id.* (citing Ex. 1003 ¶¶ 44, 49, 51, Fig. 8; Ex. 2019, 36:16–37:8; Ex. 2024 ¶ 120).

Facebook disagrees that a shared context graph could not also be "per-user," because otherwise, "the substitute claims themselves would be inoperable" given PARC's position that a person of ordinary skill in the art would have understood the term "context graph" to be "per-user." Pet. Sur-reply MTA 10–11 & n.1. But according to Facebook, a "per-user interest

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[17] Alternatively, Facebook argues that Cheng's personal interest graph can be "constructed as a separate ontology that is a subset of the global ontology." *Id.* (quoting Ex. 1003 ¶ 45). We need not address this alternative because we find Facebook's first argument persuasive.

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model can include concept nodes in the global ontology shared with other users," so "Cheng . . . discloses a per-user context graph, even if some nodes in that graph are shared." *Id.* (emphasis omitted).

We agree with Facebook, and credit Mr. Schmandt's supporting testimony, that Cheng's embodiment in which the personal interest graph for multiple users can have links to the same nodes in a shared global ontology. *See* Ex. 1003 ¶¶ 46, 51; Ex. 1021 ¶ 92. We also disagree that such an arrangement is not, still, "per-user" in the sense that each user has its own, non-shared nodes in a context graph, so we perceive no contradiction with either parties' proposed interpretations of the term "context graph." *See supra* Section IV.B.1. Thus, Facebook has shown that Cheng discloses the limitation "wherein the context graph includes nodes shared between two or more users."

(d)   <u>Amendments Regarding "Server-Side Architecture"</u>

Facebook argues that, as it explained in its Petition, Falchuk teaches the "determining" and "sending" limitations of the proposed substitute claims, which must take place at the "server-side architecture." Pet. Opp. MTA 21–22 (citing Pet. 29–31). According to Facebook, "[i]n one embodiment, the goal resolution component in Falchuk is included as part of its server-side architecture." *Id.* at 21 (citing Ex. 1004, 3:33–35). Facebook also argues that "the location of the functional components, *e.g.*, whether they reside on the client or the server, would have been regarded as a routine implementation decision." *Id.* at 21–22 (citing Pet. 43–43, 45–46; Ex. 1002 ¶¶ 109, 115; Ex. 1003 ¶¶ 40, 55; Ex. 1021 ¶ 95). Facebook contends that the

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same analysis applies to the "sending" limitation. *Id.* at 22 (citing Ex. 1004, 2:32–34; Ex. 1021 ¶¶ 97–98).

PARC does not dispute Facebook's arguments regarding these "server-side architecture" limitations, and we find them persuasive for the reasons above. *See generally* PO Reply MTA.

> (e)   <u>Conclusion as to Proposed Substitute Claims 21, 27, and 33</u>

For all reasons discussed in the sections above, we determine that Facebook has shown by a preponderance that proposed substitute independent claims 21, 27, and 33 are unpatentable as obvious over Cheng in view of Falchuk and Tseng.

> 2.   *Obviousness of Proposed Substitute Claims 22–25, 28–31, 34–37, 39, and 40*

For proposed substitute dependent claims 22–25, 28–31, 34–37, 39, and 40, Facebook relies on its arguments in the Petition for the limitations found in the original dependent claims. *See* Pet. Opp. MTA 1. PARC does not separately challenge these arguments in its Contingent Motion to Amend. *See generally* MTA; PO Reply MTA.

Thus, for all the above reasons, we conclude that Facebook shows, by a preponderance of the evidence, that proposed substitute claims 22–24, 28–30, 34–36, and 40 are unpatentable as obvious over Cheng in view of Falchuk and Tseng; that proposed substitute claims 25, 31, and 37 are unpatentable as obvious over Cheng in view of Falchuk, Richardson, and Tseng; and that proposed substitute claim 39 is unpatentable as obvious over Cheng in view of Falchuk, Shalloway, Powell, and Tseng.

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VI. CONCLUSION[18]

For the reasons above, Facebook has shown by a preponderance of the evidence that claims 1–5, 7–11, 13–17, 19, and 20 of the '439 patent are unpatentable under § 103 as obvious over Cheng in view of Falchuk (claims 1–4, 7–10, 13–16, 20), over the Cheng in view of Falchuk and Richardson (claims 5, 11, and 17), and over the combination of Cheng, Falchuk, Shalloway, and Powell (claim 19).

Also, because PARC has failed to show, by a preponderance of the evidence, that proposed substitute claims 21–25, 27–31, 33–37, 39, and 40 do not contain new matter, and because Facebook has shown, by a preponderance of the evidence, that the claims are unpatentable under § 103, we deny PARC's Contingent Motion to Amend.

VII. ORDER

In consideration of the foregoing, it is

ORDERED that claims 1–5, 7–11, 13–17, 19, and 20 of the '439 patent are unpatentable;

FURTHER ORDERED that PARC's Contingent Motion to Amend (Paper 13) is *denied*; and

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[18] Should PARC wish to pursue amendment of claims in a reissue or reexamination proceeding after this decision, we draw PARC's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If PARC chooses to file a reissue application or a request for reexamination of the challenged patent, we remind PARC of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

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FURTHER ORDERED that parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–4, 7–10, 13–16, 20	103	Cheng, Falchuk	1–4, 7–10, 13–16, 20	
5, 11, 17	103	Cheng, Falchuk, Richardson	5, 11, 17	
19	103	Cheng, Falchuk, Shalloway, Powell	19	
Overall Outcome			1–5, 7–11, 13–17, 19, 20	

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The table below summarizes our conclusions as to PARC's Motion to
Amend the claims:[19]

Motion to Amend Outcome	Claim(s)
Original Claims Cancelled by Amendment	
Substitute Claims Proposed in the Amendment	21–25, 27–31, 33–37, 39, 40
Substitute Claims: Motion to Amend Granted	
Substitute Claims: Motion to Amend Denied	21–25, 27–31, 33–37, 39, 40
Substitute Claims: Not Reached	26, 32, 38[20]

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[19] Should PARC wish to pursue amendment of the challenged claims in a
reissue or reexamination proceeding subsequent to the issuance of this
decision, we draw PARC's attention to the April 2019 *Notice Regarding
Options for Amendments by Patent Owner Through Reissue or
Reexamination During a Pending AIA Trial Proceeding. See* 84 Fed. Reg.
16,654 (Apr. 22, 2019). If PARC chooses to file a reissue application or a
request for reexamination of the challenged patent, we remind PARC of its
continuing obligation to notify the Board of any such related matters in
updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

[20] PARC has withdrawn substitute claims 26, 32, and 38 from its Motion to
Amend. *See* PO Reply MTA 1.

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